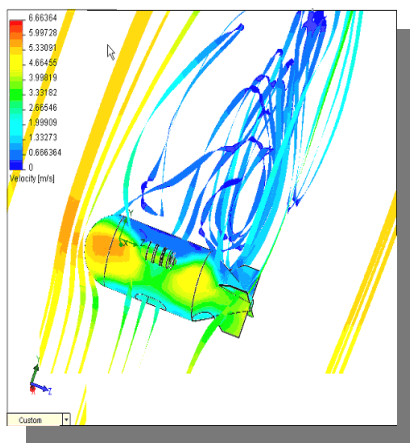


# “Mircea cel Bătrân” Naval Academy



## SCIENTIFIC RESEARCH BOOKLET



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CONSTANTA  
2019



# “MIRCEA CEL BĂTRÂN” NAVAL ACADEMY SCIENTIFIC RESEARCH BOOKLET

## History

*“Mircea cel Bătrân” Naval Academy (MBNA) is a higher education military technical institution, which has its origin in the Flotilla School established on the 17th of November 1872.*

*Thus, in 1954 the Flotilla School changed its name into the Superior Navy School, with a study*

*cycle of four years, thus being included in the national higher education system. Continuing the tradition of merchant marine officers training, starting with the academic year 1959/1960 the Merchant Marine Section is reestablished within the Superior Navy School.*

*As of January 1<sup>st</sup> 1969, the patronymic name „Mircea cel Bătrân” was bestowed upon the institution, and in 1973 the School, meant for training navy and merchant marine officers, became the Naval Institute „Mircea cel Bătrân”.*

*In 1990, the Naval Institute „Mircea cel Bătrân” becomes the Naval Academy „Mircea cel Bătrân” which represents the Romanian naval higher education, well-known and recognized by its TRADITION, VALUE and EFFICIENCY both at national and international levels.*



## *Accreditation*

- *B+ CATEGORY UNIVERSITY “education and research”-in compliance with the Ministry of Education order 5262/05.09.2011 as a result of university classification.*
- *HIGH DEGREE RELIABILITY –in compliance with the Report 441/21.01.2010 issued by the Romanian Agency for Higher Education Quality Assurance.*
- *QUALITY MANAGEMENT CERTIFICATE awarded by Bureau Veritas Certification in compliance with ISO 9001/2008.*
- *The Naval Academy Publishing House is recognized by the National Council for Scientific Research (NCSR).*
- *The Scientific Bulletin of the Naval Academy was included by the NCSR in the „B” category of reviews, as of 2009.*
- *MBNA is included in the Potential Contractors Register position 1497, in compliance with the government decision 551/2007 through NCSR decision no. 9673 as of 17.06.2008.*
- *MBNA is part of the EDRC (European Defense Research Centers) data base as governmental provider for the Romanian defense scientific research.*
- *MBNA is enrolled in the White Charta of the Scientific Research.*

## *Present organization of the scientific research activity*

*”Mircea cel Bătrân” Naval Academy is part of the research and development national system as an accredited higher education institution.*

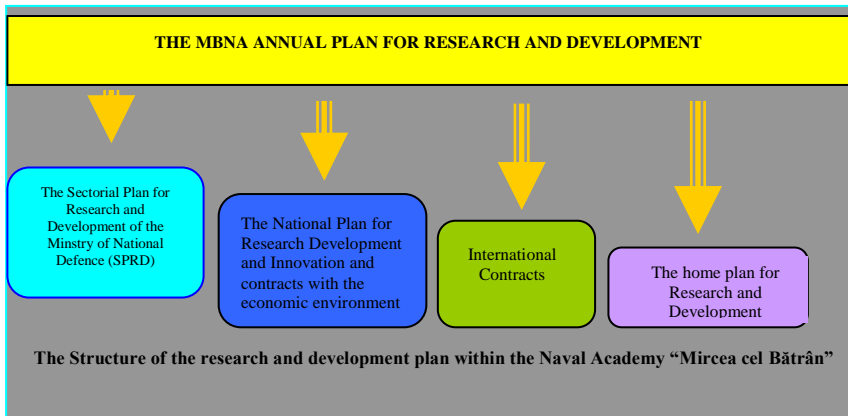
*Within ”Mircea cel Bătrân” Naval Academy the research and development activity is carried out on the basis of the Research, Development and Innovation Strategy 2014-2020, the Scientific Research Regulation and the operational procedures specific for the scientific research, according to which a generous but rigorous framework as well as favorable conditions for supporting the objectives of the research are provided.*

*The whole scientific research activity within the Naval Academy is organized and coordinated by the Scientific Council set up on the basis of art. 12. Para. (1) Law no. 324/2003 regarding the scientific research and the technological development with subsequent amendments, as a consultative body of the MBNA Senate. The Scientific Council implements the Scientific Research Strategy drawn up by the Scientific Research Committee of the Senate through the content of the operational and annual plans, whose elaboration, planning and budget, as well as monitoring and upgrading falls under its responsibility.*

*The MBNA Scientific Council carries out its activity on the basis of the Scientific Council Regulation approved by the Administration Council.*

**Organization of the Scientific Research**

*Within "Mircea cel Bătrân" Naval Academy the scientific research is carried out by the teaching staff, researchers and students, on the basis of an annual scientific research plan and an operational plan.*



*The teaching staff, the researchers and students are involved in solving diverse problems included in the projects won by competitions organized at national or international levels, or by Minister of Defense SPRD projects.*

*The MBNA annual research and development plan comprises research contracts won in different national and international competitions, based on the institution's fields of study, thus integrating the research work within the learning process.*

*The annual operational plans implement the MBNA strategic objectives mentioned in the Scientific Research Strategy through actions, programs, and projects; they have been, previously stated and evaluated, and include costs, sources, deadlines, people in charge; they all lead to the carrying out of the above mentioned objectives.*

*The MBNA students' research activity is carried out as follows:*

*a) independent research activity, under guidance of the teaching staff which takes the form of case studies, projects, diploma and dissertation thesis, etc.;*

*b) participation of students in programs/projects coordinated by departments and scientific research centers;*

*c) student scientific research groups within departments.*

*The funds for the research, development and innovation within the MBNA have a mixed source; they come either from the mechanism created by the law in force, based on the teaching activity, or from a separate mechanism based on contracts with different beneficiaries.*

### ***Strategic Guidelines for the Research Activity***

► *The rapid growth of the numbers of researchers by involving young people in formative research programs, as well as by involving researchers from outside of the institution or from abroad;*

► *Involving more and more teaching staff and research people in the scientific community, by encouraging and ensuring the mobility between universities, by creating the possibility for national and international recognition, by increasing the number of scientific publications, by giving more and more people the possibility to have access to information;*

► *Supporting international research projects which lead to regional and international cooperation;*

▶ Giving scientific research a practical purpose, taking into account the present and future needs of MBNA, as well as the needs of the Naval Forces and of the economic field.

### *Top priority research directions*

- ▶ Weapon systems engineering;
- ▶ The study of physical fields of ships;
- ▶ Research of ships' disturbing electromagnetic fields and safety measures for equipment and personnel;
- ▶ Complex study of thermal phenomena of phase exchange chemical and electro-chemical fields concerning fuel combustion in naval engines;
- ▶ Systems of conversion, storage, distribution of regenerating energies for naval transport;
- ▶ Mixed road and naval intervention systems in natural disasters and emergencies;
- ▶ Fundamental applied research in naval hydrodynamics, and naval structures engineering;
- ▶ Technologies based on exploitation of special materials in order to regenerate heat in internal combustion engines of naval and merchant ships, to enhance power and efficiency;
- ▶ Technologies based on the recycling of materials, their ecological recycling, and their re-entering the economic cycle;
- ▶ Graphical - analytical methods for the analysis of thermal processes irreversibility of internal combustion engines concerning their optimal functioning;
- ▶ Port installations for specialized terminals: dangerous cargo containers, general cargo, mineral oil cargo;
- ▶ Development and improvement of port facilities for processing and treatment of polluted waters with hydrocarbons, ship ballast waters, and used waters, etc.;
- ▶ Separation and monitoring equipment and installations for hydrocarbons;
- ▶ Protection of seafarers, fuel, and ammunition in emergency;
- ▶ Control and supervising of naval engines functioning;
- ▶ Optimizing the naval propulsion installations;

- ▶ *Optimizing the naval and port mechanical and hydro-pneumatic installations;*
- ▶ *Optimizing steam engines and steam and gas turbines.*

### ***Strategical Objectives for the 2014– 2020 period***

- ▶ *Development of research activity and performance, so that the institution might be ranked among the first 25 higher education institutions at national level;*
- ▶ *Development of CDI activities and infrastructure on top priority domains and their utilization at regional level;*
- ▶ *Development of research within European Research Area (E.R.A.).*



## *Research Infrastructure*



### *Integrated Simulator for Ship Steering*

*It can ensure the mathematical modelling of a ship's behaviour at sea, of the weather conditions, and of radar assisted operations.*

*Software: TRANSAS NTPRO 5000, ECDIS 4000, TGS 4100, NANIHARBOUR 4000, ERS 5000*

### *PROTEUS ASTT Tactical Simulator*

*It can edit and simulate models of platforms, sensors, armament, communications, hydrometeorological situations, geographical areas, depths descriptions, geographical and positioning networks, threats, restrictions and feedback for the fulfilled military actions.*

*Software: PROTEUS BASE, KCONNECTBASE*

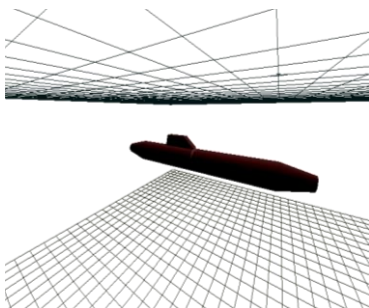


### *STING RAY Simulator*

*It can simulate torpedo launches of different submarine types, in different launching conditions.*

*It can be configured according to the launching platforms, allowing scenarios, outlining, and drill control.*

*Software: OF LINE SIMULATOR*



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***LINK 11 Simulator with C2 capabilities***

*It can simulate the main sensors on board, the C2 system, the LINK 11 and LINK 16 systems; the simulator is provided with an interface by which data can be transferred from a radio station, and from the GPS.*

***Software: CFlex***



***Hydroacoustic and Vibrations Research Laboratory - meant for research and design in the hydroacoustic and vibrator phenomena field***

***Software: ANSYS, SOLIDWORKS, PULSE13/14***

***Measurement devices for ship's electromagnetic field - meant for the study of electromagnetic compatibility of electrical installations, and protection of electronic equipment against very low frequency disturbances.***

***Software belonging to the laboratory***



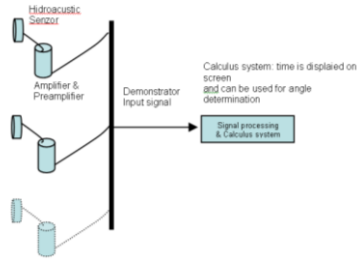
***Ship monitoring system in way points along rivers- meant for automatic identification, location in space, control supervision, as well as for obtaining data from the target***

***Software belonging to the laboratory***

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***Underwater explosion monitoring device-*** meant for the study of underwater explosion

***Software*** belonging to the laboratory



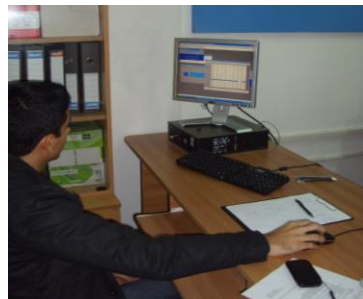
***Applied mechanical engineering laboratory-*** meant for experiment making, through which the principles of mechanics and the strength of materials are emphasized; it can be used for the identification of machinery malfunctions.

***Software:*** CIMATRON

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***Numerical laboratory for theory and naval architecture*** meant for hull design, determination of headway hull resistance and for the optimization of propeller parameters.

***Software:*** AUTOSHIP, AUTOHIDRO, MODELMAKER, AUTOPOWER, AUTOYACHT, AUTOPLATE, AUTOSTRUCTURE, MATEMATICA, MATLAB

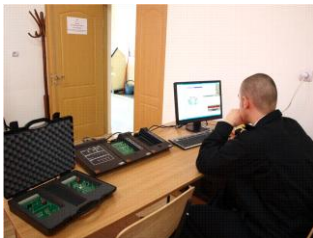


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***Electronic and electrical engineering, Interdisciplinary laboratory*** - meant for experiment making in: electronic circuits and electrotechnics basis, electrical machines, electrical and electrotechnical measurements, electromagnetic compatibility.

***Software*** belonging to the laboratory.

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**Engine laboratory-** meant for the study of internal combustion engines, functioning at different loads, using different types of fuel.

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**Heat transfer laboratory**

Experimental panel for determination of heat transfer coefficients for different fluids

**Software** belonging to the panel



**Internal combustion engines laboratory**

Experimental panel for the study of refrigerating installations parameters, for different cooling agents.

**Software** belonging to the panel

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**Internal combustion engine laboratory**

Stand for the study of internal combustion engine parameters, when working or idling.

**Software** belonging to the stand





***Internal combustion engine  
laboratory***

*Two-stroke and four- stroke engines  
with variable compression ratio  
which can be found on the stand.*

*Software belonging to the stand.*

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***Internal combustion engine  
laboratory  
Gas analyzer.***

*Software belonging to the stand*



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***Internal combustion engine  
laboratory***

*Aerodynamic tunnel for the study of  
laminar flow around the airfoil.*

*Software belonging to the stand*



## *The MBNA projects*

*The research-development activity carried out by the MBNA teaching staff, researchers and students has been mainly oriented towards the development of material resources, which lead to the acquisition of important financial support.*

### *International R&D Projects:*

- *RoNoMar-Romanian Norwegian Maritime Programme, 1.600.000 euro*
- *Res-Op-Dev-Bulgarian /Romanian Cooperation for Green Energy Development, 250.000 euro*
- *MARINE-Maritime Network of Education in Black Sea Basin, 350.000 euro*
- *DECOMAR-Development of Common Curricula Modules for Merchant Marine Officers, 150.000 euro*
- *MENTORESS- Maritime Education Network to Orient and Retain Women for Efficient Seagoing Services, 139.000 euro*
- *OPEN WINDOWS TO THE SKY-Astronomy for Young Generation(RO-BG), 141.000 euro*
- *Assistance during the labor market insertion for future marine officers - European Social Fund, 220.000 euro.*
- *Development and Implementation of Modern Solutions for Gas Turbine Propulsion System - TURBONAV, 2017-2020, 35.000 euro.*

<i>Year</i>	<i>Programme</i>	<i>Number of projects</i>	
2011	<i>PNCDI II</i>	2	9
	<i>International</i>	2	
	<i>PSCD</i>	5	
2012	<i>International</i>	2	10
	<i>PSCD</i>	8	
2013	<i>International</i>	3	12
	<i>PSCD</i>	8	
	<i>PNCDI II</i>	1	
2014	<i>PSCD</i>	6	9
	<i>POSDRU</i>	1	
	<i>International</i>	1	
	<i>PNCDI II</i>	1	
2015	<i>PSCD</i>	13	15
	<i>International</i>	1	
	<i>PNCDI II</i>	1	
2016	<i>PSCD</i>	16	17
	<i>PNCDI II</i>	1	
2017	<i>PSCD</i>	8	9
	<i>PNCDI II</i>	1	
2018	<i>PSCD</i>	14	15
	<i>PNCDI II</i>	1	

### *Outcomes*

*The outcomes of the research-development and innovation activities are assessed and validated by both beneficiaries and the MBNA, in compliance with the provisions in force. The outcomes of research consist of:*

- *products;*
- *technologies;*
- *studies.*

*As a result of the research activity there have also been a series of outcomes:*

- *modernization of the education material resources;*
- *invention certificates;*
- *technological transfer contracts;*

- *conference proceedings papers;*
- *scientific works (books or book chapters, treaties, monographs) published by well-known publishing houses;*
- *scientific articles published by well-known publishing houses;*
- *graduation diplomas and dissertation theses.*

*Here follow some of the most important achievements of the MBNA research activity:*

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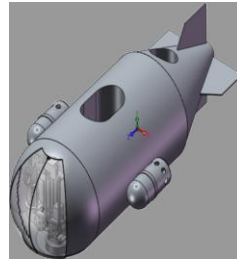
*Naval inflatable target for navy gunnery drills.*

***Project 105/2006 /PSCD of MOFD/2006-2009***

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*Underwater vehicle operated by remote control meant for research in river and maritime sectors.*

***Project 126/2007 /PSCD of MOFD/2007-2011***



*Rapid mixed road and naval system of intervention in natural disasters.*

***Project X2 CEEX X2C35/2006 /2006-2008***

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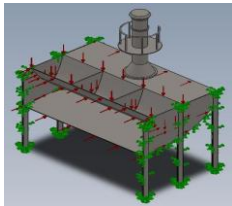




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*Unconventional combat component meant for blocking the C4I systems, by generating a powerful electromagnetic pulse.*

**Project CEEX 14/2006 /2006-2008**



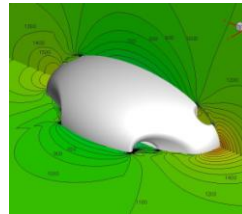
*Electrical hydro-pneumatic plant operated by waves - experimental model for the use of wave energy, centered around the potential energy of the Black Sea waves.*

**Project PNCDI II 21-011/2007 /2007-2010**

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*Technological platform for utility and pleasure mini robots operated by remote control, through cables, able to operate in poor visibility, in hard-to-reach places and improper work conditions (polluted environment, chemical substances)*

**Project PNCDI II Programme 4/2008 /2008-2010**



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*Underwater vehicle operated by remote control*  
**Project PSCD of MOFD/150/2015**





*Autonomous naval surface platform  
for the acquisition and transmission  
of data from a maritime district  
**Project PSCD of MOfD 151/2016***

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*Identification friend-or foe (IFF)  
system for Romanian magnetic and  
acoustic mines  
**Project PSCD of MOfD 146/2018***



*Experimental research on the  
implementation of renewable energy  
sources in order to supply an  
electrical engineering laboratory  
**Project PSCD of MOfD 145/2018***

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## *Awards and medals*

- May 2012, EUROINVENT, Iași - **Gold medal** - *Electromagnetic Pulse Generating System in the Loop Current Controlled Explosion, (Vasile DOBREF and others.);*

- May 2012, EUROINVENT, Iași – **Gold medal** – *Mini Class Underwater Remotely Operated Vehicle, (Octavian TĂRĂBUȚĂ, Vasile DOBREF);*

- May 2012, EUROINVENT, Iași – **Special award** of Korea Invention Academy – *Mini Class Underwater Remotely Operated Vehicle.*

- EUROINVENT 2015 - **European Exhibition of Creativity and Innovation Iași** - *Unmanned Surface Vehicle- The Great, Prof. Vasile DOBREF, Dragoș MIHAILOVICI, Daniel AVRAM, Gold medal*

- EUROINVENT 2015 - **European Exhibition of Creativity and Innovation Iași** - *Mobile surface device for preventing gas leakage aboard ships: F-BOT v1.2, Petrică POPOV, Alexandru POHONȚU, Silver medal*

- EUROINVENT 2016, **Gold medal and silver medal** – *Relative to the Increase of Electricity Transportation Efficiency, Alexandru SOTIR, Vasile DOBREF, Petrică POPOV.*

- CADETINOVA 2017, Aprilie, **International Inventive Salon, Sibiu**, *Automated Naval Photo-Electricity Collector, student Alexandru POHONȚU, Gold medal*

*Dissemination of the research-development results*

To disseminate results of the research-development and innovation activities, „Mircea cel Bătrân” Naval Academy  
*a. runs the following scientific events:*

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*The International Scientific Conference SEA-CONF*



*The Scientific Conference for Masters Students  
MASTER-NAV*

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*The Scientific Conference for Bachelor Degree Students  
CADET-NAV*



*Graduate Student Scientific seminar*

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*Publishes biannually the Scientific Bulletin*



## *Contact*

**Address:** 1<sup>st</sup> Fulgerului Street, 900218, Constanta, Romania

**Telephone:** 00400241626200

**Fax:** 00400241643096

**Web page:** [www.anmb.ro](http://www.anmb.ro)

**Research e-mail:**

[cercetare@anmb.ro](mailto:cercetare@anmb.ro)

**E-mail addresses of the scientific events:**

[sea-conf@anmb.ro](mailto:sea-conf@anmb.ro)

[cadetnav@anmb.ro](mailto:cadetnav@anmb.ro)

[masternav@anmb.ro](mailto:masternav@anmb.ro)

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Technical & Administrative Research Department

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