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МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ АВІАЦІЙНИЙ УНІВЕРСИТЕТ
01132330
МІСТО КИЇВ

Virazh aero
NATIONAL AVIATION UNIVERSITY

НАЦІОНАЛЬНИЙ АВІАЦІЙНИЙ УНІВЕРСИТЕТ
MCMXXXIII

The program
of training courses for external pilots of UAV

Kyiv – 2019

1. ABSTRACT

Training courses for external pilots of unmanned aerial vehicle (UAV) are designed for the training of specialists whose job duties consist in piloting UAV within and outside optical visibility.

Depending on the level of acquired knowledge, skills and abilities of practical piloting, subject to positive results in theoretical disciplines, a cadet is assigned one of the following qualification levels:

- an external pilot of a small UAV with a maximum take-off weight of up to 20 kg and a piloting resolution within the limits of optical visibility CPL (m);
- an external pilot of a light UAV with a maximum take-off weight of 20 to 150 kg and a piloting resolution within optical visibility and outside its CPL (l);
- an external pilot UAV with a maximum take-off weight of more than 150 kg and a piloting resolution within optical visibility and outside of its ATPL (b).

The program of courses provides conducting training sessions for such courses:

• Air Law
• General knowledge about UAV
• Flight characteristics and planning
• Human capabilities and limitations
• Meteorology
• Navigation
• Operational procedures
• Principles of flight
• Means of communication
• General flight safety
• Knowledge of a specific unmanned aviation system (UAS)

Duration of training - 4 weeks.

Training is held at the National Aviation University.

Upon completion of training students receive a certificate of external pilot of the established sample.

1.1. Program goal

The purpose of the program of training for external pilots UAV is to provide listeners with systematic theoretical knowledge about design, function, operation, and piloting of UAV and the practical skills necessary for piloting of UAV.

2. GENERAL PROVISIONS

2.1. Regulatory documents on the basis of which the program is developed

- Air Code of Ukraine, 2011
- JAR-FCL 1: Issuance of certificates to the flight crew (aircraft)
- CAP 722. Unmanned Aircraft System Operations in UK Airspace
- CAP 658. Model Aircraft: A Guide to Safe Flying
- Unmanned aviation systems (UAS), Circular 328 // Doc. ICAO AN 190, 2011
- Jane's Unmanned Aerial Vehicles and Targets (juav.janes.com) // Issue Thirty-four, May 2010

2.2. Requirements for candidates for training

Listeners of the training courses for external pilots of UAV should:

- have a higher or secondary special, preferably technical education and be tested for professional suitability;
- be at least 18 years old;
- be mentally and physically advanced for the safe piloting of UAV.

2.3. Preparation stages

The courses are conducted in 2 stages: the first is the study of theoretical disciplines; the second is the practical training of external pilots.

2.4. Qualification requirements for trained listeners

After completing training courses for external pilots of UAV, listeners should have the knowledge and skills for piloting UAV, corresponding to the current level of training of external pilots of UAV.

Depending on the level of training achieved, listeners should:

know:

• Fundamentals of Ukrainian legislation, international standards and recommended practice in the field of civil aviation.
• Basics of design, function and operation of UAS.
• Basic flight characteristics and planning.
• Basics of human capabilities and limitations.
• Basics of aeronautical meteorology.
• Basics of navigation.
• Operational procedures.
• Basic principles of flight.
• Basics of communication.
• Fundamentals of flight safety.
• General knowledge of a specific UAS.

be able to:

• Perform pre-flight preparation and launch of the power point, identify faults.
• Takeoff the UAV taking into account operational factors (conditions of basing, state of the atmosphere, power supply of UAV, state of the runway, etc.).
• Piloting UAV on the route and in the flight zone in accordance with the established task.
• Landing UAV taking into account operational factors (conditions of basing, state of the atmosphere, power supply of UAV, state of the runway, etc.).
• Effectively act in special situations that may occur during takeoff, en-route, in-zone and landing.
• Carry out an emergency landing with minimal damage to the UAV structure, environment, buildings and people.
• Carry out post-flight inspection of UAV and its systems to assess the condition and suitability for further operation.

3. CURRICULUM FOR TRAINING COURSES OF EXTERNAL PILOTS OF UAV

The curriculum for the first (theoretical) stage involves listening to 10 thematic modules. Each module provides a list of recommended literature and a list of test questions.

3.1. Calculation of training time

Duration of training:
Calendar days 29
Duration of study day 4 hours
Number of study hours **116**

3.2. Distribution of study hours by modules

No. module	Module title	Duration, hours	Form of control
1.	Air Law	8	Intermediate testing Q1
2.	General knowledge about UAS	8	Intermediate testing Q2
3.	Flight characteristics and planning of flight	8	Intermediate testing Q3
4.	Human capabilities and limitations	8	Intermediate testing Q4
5.	Meteorology	8	Intermediate testing Q5
6.	Navigation	8	Intermediate testing Q6
7.	Operational procedures	8	Intermediate testing Q7
8.	Principles of flight	8	Intermediate testing Q8
9.	Means of communication	8	Intermediate testing Q9
10.	General flight safety	8	Intermediate testing Q10
11.	Knowledge of a specific UAS	8	Intermediate testing Q11
	Total	88	

3.3. Modules content

Module 1. Air Law
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Convention on International Civil Aviation	2	2	2
	Documents: 1.			
1.2	Annexes to the Convention	2	2	2
	Documents: 2, 3, 4, 5, 6.			
1.3	Document 4444 ICAO - Flight Rules and Air Traffic Services	-	2	2
	Documents: 7.			
1.4	Regulations JAA	-	2	2
	Documents: 8.			
Total		**4**	**8**	**8**

Question of the intermediate test Q1 (see Annex 1)

Documents
Main
1. Convention on International Civil Aviation, Doc 7300/8 – 2000.
2. Annex 2 ICAO – Flight Rules, 1995.
3. Annex 7 ICAO – National and registration marks of the aerial vehicle.
4. Annex 8 ICAO – Airworthiness of aerial vehicles.
5. Annex 11 ICAO – Air traffic service.
6. Annex 14 ICAO – Airfields.

7. Document ICAO 4444 ATM/501 – Organization of air traffic.
8. JAR-FCL – Issuance of certificates to the flight crew (aircraft).

Auxiliary

1. Handout.

Module 2. General knowledge about UAS

Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Airframe	2	2	2
	Documents: 1, 2, 3.			
1.2	Power point	2	2	2
	Documents: 5, 6.			
1.3	Systems	-	2	2
	Documents: 4.			
1.4	Devices. Airworthiness	-	2	2
	Documents: 7, 8, 9, 10.			
Total		**4**	**8**	**8**

Question of the intermediate test Q2 (see Annex 2)

Documents

Main

1. Konstruktsiya i prochnost' letatel'nykh apparatov grazhdanskoy aviatsii (Construction and strength of aerial vehicles of civil aviation) // Pod red. K.D. Mirtova, ZH.S. Chernenko – M.: Mashinostroyeniye, 1991. – 448 p. (In Russian).

2. Garazha V.V. Konstruktsiya samoletov (Aircraft design) – K .: KMUGA, 1998. – 524 p. (In Russian).

3. Chelyukanov I.P., Savel′yev H.V. Konstruktsiya litakiv. Konspekt lektsiy (Aircraft design. Summary of lectures) – K.: NAU, 2004. – 188 p. (In Ukrainian).

4. Garazha V.V., Zheliba A.N., Kazanets V.I. i dr. Funktsional'nyye sistemy vozdushnykh sudov: Uchebnoye posobiye (Aircraft Functional Systems: Tutorial) – Kiev: KIIGA, 1989. – 402 p. (In Russian).

5. Maslennikov M.M., Rapoport M.S. Aviatsionnyye porshnevyye dvigateli (Aircraft piston engines) – M.: Oborongiz, 1951 (In Russian).

6. Zaikin A.Ye. i dr. Aviatsionnyye dvigateli. Konstruktsiya i raschet detaley (Aircraft engines. Construction and calculation of parts) – M.: Oborongiz, 1941 (In Russian).

7. Aviatsionnoye oborudovaniye (Aviation equipment). Pod red. Dobromenskogo YU.P., Voyennoye izdatel'stvo, M., 1989 – 248 p. (In Russian).

8. Mayorov A. V., Yanovskiy B.F. Aviatsionnoye oborudovaniye letatel'nykh apparatov (Aviation equipment of aerial vehicles). «Transport», M., 1993 – 241 p. (In Russian).

9. Vereshchaka L. I., Olyanyuk P. V. Aviatsionnoye radiooborudovaniye (Aviation radio equipment). «Transport», M., 1996 – 344 p. (In Russian).

10. Kharchenko V. P., Kravets′ O.I. Navihatsiyno-posadochna aparatura povitryanykh suden ta yiyi tekhnichna ekspluatatsiya (Navigation landing equipment of aircraft and its technical operation). NAU, K., 2005 – 123 p. (In Ukrainian).

Auxiliary

1. Handout.

Module 3. Flight characteristics and planning of flight
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Weight and centering	2	2	2
	Documents: 1, 2, 3, 4, 5, 6.			
1.2	Flight-technical characteristics	-	2	6
	Documents: 2, 3, 4, 5.			
Total		**2**	**4**	**8**

Question of the intermediate test Q3 (see Annex 3)

Documents
Main

1. Aerodinamika i dinamika poleta magistral'nykh samoletov (Aerodynamics and flight dynamics of long-haul aircraft). Pod red. Byushgesa G.S. – M. – Pekin: TSAGI i AVIA, 1995 – 772 p. (In Russian).

2. Flight Performance and Planning. Mass and Balance Performance – Oxford Avaiation Services Limited, 2005 – 437 p.

3. Flight Performance and Planning. Flight Planning and Monitoring – Oxford Avaiation Services Limited, 2005 – 471 p.

4. Markov V.I. Metodika vypolneniya predvaritel'nykh raschetov poleta (The method of performing preliminary calculations of the flight) – Kirovograd: KVLU GA, 1991 (In Russian).

5. Nikolayev L.F. Osnovy aerodinamiki i dinamiki poleta transportnykh samoletov (Fundamentals of aerodynamics and flight dynamics of transport aircraft) – M.: Transport – 1997 – 232 p. (In Russian).

6. Lysenko N.M. Dinamika poleta (Flight dynamics) – M.: VVIA im. N.Ye. Zhukovskogo – 1967 – 639 p. (In Russian).

Auxiliary

1. Handout.

Module 4. Human capabilities and limitations
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Basic physiology	2	4	4
	Documents: 2.			
1.2	Basic psychology	-	2	4
	Documents: 1, 3, 4, 5.			
Total		**2**	**6**	**8**

Question of the intermediate test Q4 (see Annex 4)

Documents
Main

1. Osnovy psikhologii (Fundamentals of psychology)/Otv. Red. Il'in – M.: INFA, 1998. – 432 p. (In Russian).

2. Batuyev A.S., Kulikov G.A. Vvedeniye v fiziologiyu sensornykh sistem (Introduction to the physiology of sensory systems) – M., 1991 (In Russian).

3. Korchemnyy P.A. Psikhologiya letnogo obucheniya (Psychology of flight training) – M.: Voyenizdat,

1986. – 136 p. (In Russian).

4. Makarov R.N. Osnovy formirovaniya professional'noy nadezhnosti letnogo sostava grazhdanskoy aviatsii (Fundamentals of the formation of professional reliability of civil aviation flight personnel) – M.: Vozdushnyy transport, 1990. – 384 p. (In Russian).

5. Platonov K.K., Gol'dshteyn B.M. Osnovy aviatsionnoy psikhologii (Fundamentals of aviation psychology) – M.: Transport, 1987. – 222 p. (In Russian).

Auxiliary

1. Handout.

Module 5. Meteorology

Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Atmosphere. Pressure, density and temperature. Humidity and precipitation. Pressure and wind	2	2	2
	Documents: 1, 2, 3, 4, 5.			
1.2	The formation of clouds. Fog, haze and mist. Air masses	-	2	2
	Documents: 1, 2, 3, 4, 5.			
1.3	Frontology. Icing. Thunderstorms. Flight over high altitude zones	-	-	2
	Documents: 1, 2, 3, 4, 5.			
1.4	Climatology. Altimetry. Meteorological organization. Synoptic analysis and forecasting. Weather information for flight planning	-	-	2
	Documents: 1, 2, 3, 4, 5.			
Total		**2**	**4**	**8**

Question of the intermediate test Q5 (see Annex 5)

Documents

Main

1. Baranov A.M. i dr. Aviatsionnaya meteorologiya (Aviation meteorology) – S-P.: Gidrometeoizdat, 1992. – 344 p. (In Russian).

2. Voronina L.I., Yaroshkevich L.V. Prakticheskoye primeneniye sovremennoy meteorologicheskoy informatsii na mezhdunarodnykh vozdushnykh liniyakh (Practical application of modern meteorological information on international airlines) – M.: AO «Ekos», 1999. – 176 p. (In Russian).

3. Leshchenko G., Pertsel' G., Ivanova Ye. Meteorologicheskoye obespecheniye poletov (Meteorological flight support) – 2003. – 180 p. (In Russian).

4. Astapenko P.D., Baranov A.M., Shvarev I.M. Pogoda i polety samoletov i vertoletov (Weather and flights of airplanes and helicopters) – L.: Gidrometeoizdat, 1981. – 383 p. (In Russian).

5. Annex 3 to the Convention on International Civil Aviation "Meteorological Support for International Navigation" – ICAO, Montreal, 2007 – 180 p.

Auxiliary

1. Handout.

Module 6. Navigation
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Navigation	-	2	6
	Documents: 1, 2, 3, 4.			
1.2	Radio navigation	-	2	2
	Documents: 1, 2, 3, 4.			
Total		**-**	**4**	**8**

Question of the intermediate test Q6 (see Annex 6)

Documents
Main
1. Chernyy M.A., Korablin V.I. Vozdushnaya navigatsiya (Aerial navigation) – M.: Transport, 1985 (In Russian).
2. Belkin A.M., Mironov N.F., Rublev YU.I., Savrayskiy YU.N. Vozdushnaya navigatsiya. Spravochnik (Aerial navigation. Directory) – M.: Transport, 1988 (In Russian).
3. Leyzerakh A.A. Sbornik zadach po samoletovozhdeniyu (Collection of tasks for navigation) – M.: Transport, 1969 (In Russian).
4. Mikhaylov N.A. Vozdushnaya navigatsiya (mezhdunarodnyye polety) (Air navigation (international flights) – Novosibirsk, 2000 (In Russian).
Auxiliary
1. Handout.

Module 7. Operational procedures
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Annex 6	-	2	2
	Documents: 1.			
1.2	Annex 12	-	-	2
	Documents: 2.			
1.3	Annex 13	-	-	2
	Documents: 3, 4.			
1.4	Noise reduction. Violation of aviation legislation	-	2	2
	Documents: 5.			
Total		**-**	**4**	**8**

Question of the intermediate test Q7 (see Annex 7)

Documents
Main
1. Annex 6 ICAO – Aerial vehicle operation.
2. Annex 12 ICAO – Search and rescue.
3. Manual on Aviation and Maritime Search and Rescue, Doc 7333-AN/859. – ICAO, Montreal, 2001.
4. Annex 13 ICAO – Aviation accident occurrences investigation.
5. Annex 16 ICAO – Environmental protection. T.1. Aviation noise.

Auxiliary
1. Handout.

Module 8. Principles of flight
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Atmosphere	2	2	2
	Documents: 1, 2, 3, 4.			
1.2	Airflow around the body	2	2	2
	Documents: 1, 2, 3, 4.			
1.3	The distribution of the four forces. Flight controls	2	2	2
	Documents: 1, 2, 3, 4.			
1.4	Stall. Sustainability. Load factor and maneuvers	-	2	2
	Documents: 1, 2, 3, 4.			
Total		**6**	**8**	**8**

Question of the intermediate test Q8 (see Annex 8)

Documents
Main
1. Aerodinamika i dinamika poleta magistral'nykh samoletov (Aerodynamics and flight dynamics of long-haul aircraft). Pod red. Byushgesa G.S. – M. –Pekin: TSAGI i AVIA, 1995 – 772 p. (In Russian).
2. Nikolayev L.F. Osnovy aerodinamiki i dinamiki poleta transportnykh samoletov (Fundamentals of aerodynamics and flight dynamics of transport aircraft) – M.: Transport – 1997 – 232 p. (In Russian).
3. Jeppesen Sanderson Aviation fundamentals. – Denver – 1978.
4. Principles of Flight – Oxford Aviation Services Limited, 2005 – 651 p.
Auxiliary
1. Handout.

Module 9. Means of communication
Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Radiotelephony and communications. Departure rules	-	2	2
	Documents: 1, 2, 4, 7, 8, 9, 13, 14.			
1.2	Rules of action on the route. Arrival order and traffic patterns	-	2	2
	Documents: 1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14.			
1.3	Loss of radio communication	-	2	2
	Documents: 1, 6, 9, 10, 11, 13, 14.			
1.4	Emergency and urgent action rules	-	2	2
	Documents: 1, 2, 9, 10, 11, 12, 13, 14.			
Total		**4**	**8**	**8**

Question of the intermediate test Q9 (see Annex 9)

Documents

Main

1. Air Code of Ukraine, 2011.
2. Regulations on the use of airspace of Ukraine. Resolution of the Cabinet of Ministers of Ukraine from 29.03.02 №401.
3. The procedure for performing visual maneuvering in the area of the aerodrome when flying according to instrument flight rules. Order of Ukraviatrans from 29.08.02 №441.
4. The rules for granting permits to operators to depart from the airports of Ukraine and arrive at the airports of Ukraine during international, internal and transit flights. Joint order of the Ministry of Transport of Ukraine and the Ministry of Defense of Ukraine from 16.01.03 by №317/7638.
5. Demonstration flights regulations. Order of the Ministry of Transport of Ukraine from 08.04.03 by №269, registration of the Ministry of Justice of Ukraine from 12.06.03 by №479/7800.
6. Rules of flights and air traffic services in the classified airspace of Ukraine (part of the Rules of flights in the airspace of Ukraine). Order of the Ministry of Transport of Ukraine from 16.04.03 №293, registration of the Ministry of Justice of Ukraine from 05.05.03 by №346/7667.
7. Provision on pre-flight information services at the airfields of civil aviation of Ukraine. Order of the Ministry of Transport of Ukraine from 25.06.03 №458, registration of the Ministry of Justice of Ukraine from 10.07.03 by №573/7894.
8. The procedure for the establishment and use of standard routes of departure, arrival and approach to the instrument. Order of Ukraviatrans from 12.08.03 №445.
9. Telecommunication rules in civil aviation of Ukraine. Order of the Ministry of Transport of Ukraine from 23.09.03 №736, registration of the Ministry of Justice of Ukraine from 31.10.03 by №1001/8322.
10. Classification of the airspace of the air traffic service of Ukraine. Order of Ukraviatrans from 19.05.04 №280.
11. Rules for conducting radiotelephone communication and phraseology of radio exchange in the airspace of Ukraine. Order of the Ministry of Transport of Ukraine from 10.06.04 №486, registration of the Ministry of Justice of Ukraine from 06.07.04 by №844/9443.
12. About the installation in the airspace of Ukraine type RNP and the size of buffer zones. Order of Ukraviatrans from 20.07.04 №417.
13. Annex 2 to the Convention on International Civil Aviation. Flight rules, 1995.
14. Document 4444, PAC/501/12 Flight Rules and Air Traffic Services, 1996.

Auxiliary

1. Handout.

Module 10. General flight safety

Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	Modern concept of flight safety	-	4	4
	Documents: 1, 2, 3, 4.			
1.2	Events in aviation. Actions in special situations	4	4	4
	Documents: 1, 3, 5.			
Total		**4**	**8**	**8**

Question of the intermediate test Q10 (see Annex 10)

Documents

Main

1. Air Code of Ukraine, 2011
2. Rukovodstvo po upravleniyu bezopasnost'yu poletov (Safety Management Guide). Dok 9859 AN/474,

izdaniye vtoroye – 2009 (In Russian).

3. CAP 658. Model aircraft: A guide to safe flying, 2012.

4. Rukovodstvo po obucheniyu v oblasti chelovecheskogo faktora (Human Factors Training Guide): ICAO – Dos. 9683 – AN/950, 1998 (In Russian).

5. Skripnik F.I., Davidenko M.F., Kovtyukh N.G. Bezopasnost' poletov v voprosakh i otvetakh (Flight safety in questions and answers). – K.: KMUGA, 1997. – 315 p. (In Russian).

Auxiliary

1. Handout.

Module 11. Knowledge of a specific UAS

Distribution of study hours by module topics

No.	Topic title	Duration, hours		
		CPL(m)	CPL(l)	ATPL (b)
1.1	The design of the airframe UAV and its operation	2	2	2
	Documents: 1, 2.			
1.2	The design of the engine UAV and its operation	2	2	2
	Documents: 1,2.			
1.3	Mobile station external pilot and its operation	2	2	2
	Documents: 1, 2.			
1.4	Fixed station of external pilot and its operation	-	2	2
	Documents: 1, 2.			
Total		**6**	**8**	**8**

Question of the intermediate test Q11 (see Annex 11)

Documents

Main

1. Unmanned Aviation Systems (UAS), Circular 328 // Doc. ICAO AN 190, 2011 (www.icao.int) – 66 p.

2. Jane's Unmanned Aerial Vehicles and Targets (juav.janes.com) // Issue Thirty-four, May 2010, Editor: Mark Daly – 735 p.

Auxiliary

1. Handout.

3.4. Practical training of external pilots

The practical training of external pilots consists of four main types:

- ground;
- preliminary;
- preflight – flights;
- flight analysis.

Ground training is intended to study and deepen knowledge on the implementation of this exercise as a whole. Conducted before the exercise under the guidance of an instructor and independently. Questions of theory, the meaning and order of the exercise, piloting features, training on the simulator and the like are being studied.

Preliminary training is carried out on the eve of the flight day. The task is considered on the flight day, the order of its execution. A planned table of flight is compiled. Is studying the mistakes made in the previous flight day and outline ways to eliminate them. Conducted with an instructor.

Preflight preparation is carried out at the aerodrome and is aimed at clarifying the task from the actual weather conditions, checking the technical condition of the UAS, the aerodrome, establishing the direction of take-off, selection of landmarks, and the like.

Flight analysis is performed by the instructor after the completion of each flight day. A general analysis and assessment of completed flights, the implementation (non-fulfillment) of the flight program, mistakes made in piloting techniques, analysis of the cause and ways of elimination are performed. Each cadet records all his mistakes in the technique of piloting in the “Cadet's Diary”.

References:

1. Kayunov N.T., Vasil'chenko M.Ye. Podgotovka pilota radioupravlyayemykh modeley (Training pilot of radio-controlled models) // V sbornike “Informatsionnyye materialy”. – M:. DOSAAF, 1978 (In Russian).
2. Lapinski K. Poradnik modelarza lotniczego. – WKL, Warszava, 1984.
3. Taradeyev B. Modeli-kopii samoletov (Model-copy aircraft). – M:. Patriot, 1990 (In Russian).
4. Schier W. Miniaturowe lotnictwo. – WKL, Warszawa, 1973.
5. Matiychyk M. Vodinnya bezpilotnykh mikro litakiv v umovakh tekhnolohichnykh protsesiv zakhystu roslyn (Steering unmanned micro aircraft in the conditions of plant protection technological processes) // Visnyk TDTU. Ternopil′ 2001, 69-76 p. (In Ukrainian).
6. Krolikevicz T. Wspolczesne samoloty skolne. – WKL, Warszawa, 1982.

3.5. Thematic plan of practical training external pilot

No.	Exercise	Duration, hours	Form of control
1	Ground preparation for flight operations	2	Intermediate testing
2	"Take out" flights	4	Test flights
3	Ground preparation for "take out" flight on simple aerobatics	2	Intermediate testing
4	"Take out" flights on simple aerobatics	6	Test flights
5	Ground preparation for taking off, plotting a route, calculating the landing, landing	2	Intermediate testing
6	Control and independent flights in a circle	7	Test flights
7	Training flights to the zone	5	Test flights
8	Flights to complex aerobatics	7	Test flights
9	Test flights	3	Test
	Total	28	

4. DATA ON TEACHING STAFF

No.	Full Name	Year of birth	Experience of pedagogical work, years	Academic degree, academic title, position	Internship training (where, when)	Note
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						

Curriculum developed by _____M. Matiichyk
_____V. Kabanyachyy.

ANNEXES

Annex 1

Question of the intermediate test Q1

1. Chicago Convention: factors that have led to the need for signing.
2. The basic principles of regulation of civil aviation under the Chicago Convention.
3. Annexes to the Chicago Convention: appointment and structure of requirements.
4. Explain the difference between “standard” and “recommended practice” in the Annexes to the Chicago Convention.
5. Annex 7 Onboard and registration marks.
6. Annex 8 Airworthiness.
7. Annex 2 Flight Rules.
8. Annex 11 Air traffic control and air traffic services.
9. Annex 14 Characteristics of the airfield.
10. The main European organizations for civil aviation, their main activities.
11. The main activities of the EASA.
12. The main activities of the ECAC (European Conference on Civil Aviation).
13. The main activities of the EVROCONTROL.
14. The main activities of the IATA.
15. Explain the main difference between the regulatory activities of ICAO and IATA.
16. The main types of aircraft leasing and their features.
17. Aircraft Registration, Registration Certificate.
18. The composition of the documents that must be on board the aircraft: the purpose of each of them and their combination.
19. The purpose of the basic aviation legislation of the state (for example, the Air Code of Ukraine).
20. Airworthiness certificate of the aircraft.
21. Components of the Operator’s main/primary responsibility for the flight suitability of an aircraft instance.
22. The ratio of development and approval between the Main List of Minimum Equipment (MMEL) and the List of Minimum Equipment (MEL).
23. Limited authority for the performance and certification of maintenance work (limited certification authorization) by crew members: the appointment and conditions for obtaining credentials by crew members.
24. Visual flight rules.
25. Flight rules and air traffic services.
26. Aerodrome dispatch service.
27. Flight information and emergency notification service.
28. United Aviation Authority (JAR).
29. Regulatory documents of united aviation authority (JAR-FCL).
30. Certificate of private pilot.

Annex 2

Question of the intermediate test Q2

1. Airframe structure.
2. The principles of the four-stroke internal combustion engine.
3. Starting an internal combustion engine.
4. Internal combustion engine adjustment.
5. Features of operation of the internal combustion engine.
6. Engine cooling.
7. Engine lubrication.
8. Ignition systems.
9. Carburation.
10. Aviation motor fuel.
11. Fuel system.
12. Screws.
13. Engine control.
14. Electrical system.
15. Air pressure receiver.
16. Airspeed indicator.
17. Altimeter.
18. Vertical speed indicator.
19. Position Indicator (UAV) in space.
20. Course indicator.
21. Magnetic compass.
22. Thermometer of oil.
23. Lubrication gauge.
24. Cylinder head thermometer.
25. Flow meter.
26. Fuel meter.
27. Fuel gauge.
28. Flight information recorder.
29. Airworthiness.
30. Formats on the UAV, engine and screw.

Annex 3

Question of the intermediate test Q3

1. Weight and centering.
2. Stability and controlling.
3. Longitudinal static stability.
4. The influence of various factors on the longitudinal moment.
5. The effect of centering on the longitudinal moment.
6. Maximum weight limit.
7. Limitations of front and rear centering.
8. Mass and center of gravity calculations.
9. Longitudinal static control.
10. The effect of the power plant on the moment diagram.
11. Longitudinal static handling.
12. Takeoff.
13. Run length and available distance.
14. Takeoff and initial climb.
15. Influence of mass, wind and air density on takeoff.
16. Influence of the surface of the earth on takeoff.
17. Use flaps on takeoff.
18. Landing.
19. Influence of mass, wind, air density and approach speed on landing.
20. Use flaps on landing.
21. Influence of the surface of the earth on landing.
22. The ratio between the required and possible power.
23. Maximum speed and maximum climb angle.
24. Range and fuel capacity.
25. Typical horizontal flight speeds.
26. Favorable horizontal flight speed.
27. The influence of configuration, mass, temperature and altitude on the implementation of horizontal flight.
28. Decrease in flight characteristics at turn with climb.
29. Gliding.
30. Adverse external effects.

Annex 4

Question of the intermediate test Q4

1. Atmospheric composition.
2. Gas state equation.
3. Breath and blood circulation.
4. The main components of the cardiovascular system.
5. Blood pressure and heart rate.
6. General characteristics of the breathing process.
7. Analysis of the gas composition of alveolar air. Gas exchange in the alveoli.
8. Physiology of vision.
9. The limitation of the visual system.
10. Optical illusion.
11. Disorientation in space.
12. Physiology of hearing.
13. Inner ear sensitivity.
14. Noise and hearing loss.
15. Flight and health.
16. Fatigue.
17. Impact of negative factors on health.
18. The means to maintain the health of the pilot in proper condition.
19. Perception concept.
20. Perception of motion information and spatial position.
21. Physiological systems involved in the perception of information about movement and spatial position.
22. Central channel decision making.
23. Mental load, restrictions.
24. Memory and its limitations.
25. Loading.
26. Identify and reduce loading.
27. Stress and its impact on performance.
28. Errors and violations.
29. Sleep.
30. Models and their use.

Annex 5

Question of the intermediate test Q5

1. Composition and structure of the atmosphere.
2. Barometric pressure, isobars.
3. Changes in pressure, density and temperature with altitude.
4. Daily temperature change.
5. Water vapor in the atmosphere.
6. Atmospheric condensation.
7. High and low pressure zones.
8. Atmospheric motion, pressure gradient.
9. Vertical and horizontal air movement.
10. The effect of wind gradient and wind displacement during takeoff and landing.
11. Cloud types.
12. Convection clouds.
13. Orographic clouds.
14. Spherical and cumulus clouds.
15. Flight conditions past each of the types of clouds.
16. Radiation, advectional, frontal, freezing fog.
17. Reduced visibility due to haze, snow, smoke, dust and sand.
18. Modification of air masses during movement.
19. Growth of low and high pressure systems.
20. Weather conditions related pressure systems.
21. Formation of cold and warm fronts.
22. The growth of a warm front.
23. The growth of the cold front.
24. Adjacent clouds and weather conditions.
25. Thunderstorm.
26. Flying over the highlands.
27. Climatology.
28. Altimetry.
29. Meteorological organization.
30. Synoptic analysis and forecasting.

Annex 6

Question of the intermediate test Q6

1. Earth shape.
2. Hemispheres, North/South, East/West.
3. Aeronautical charts and schemes (topographic).
4. Conformal orthokut projection (ICAO scheme 1.500,000).
5. Aircraft magnetism.
6. Orientation material on the schemes/read card.
7. Principles of navigation.
8. What is air navigation?
9. What is aircraft navigation?
10. What is a flight card?
11. What is the onboard card for?
12. What is geographic latitude?
13. What is geographic longitude?
14. What is an airplane course (course interdependence)?
15. What is “the azimuth of an aircraft”?
16. What is “Universal Coordinated Time (UTC)”?
17. What is “zone time”?
18. What is the “flight time of the aircraft”?
19. What is “height safe”?
20. What is a “flight altitude”?
21. What is a “line of a given path”?
22. What is the “actual path line”?
23. What is a magnetic anomaly?
24. What is magnetic deviation?
25. What is the place of the aircraft?
26. What is orientation loss?
27. What is the “aeronautical stock of fuel”?
28. What is the “course of the aircraft”?
29. What is the present height (N_{pr}), absolute height (N_{abs}), barometric height (N_{bar})?
30. Flight planning.

Annex 7

Question of the intermediate test Q7

1. Flight preparation.
2. Order of action during the flight.
3. Flight characteristics.
4. Operational limitations.
5. Instruments and equipment.
6. Navigation equipment.
7. Maintenance.
8. Search provision of flights.
9. Organization of search flight support.
10. Coordination Center for Search and Rescue.
11. Emergency and rescue provision of flights.
12. Phases of emergency alert.
13. Conducting emergency and rescue operations.
14. Actions in case of emergency.
15. Planning of work in case of emergency with UAV.
16. ICAO Annex 13 Accident Investigation Requirements.
17. Responsibilities of the state of the place of accidents.
18. Requirements for the rules for investigating aviation accidents.
19. Primary accident report.
20. Organization of investigation of aviation accidents.
21. Accident investigation algorithm.
22. The structure of the accident investigation commission.
23. Requirements for methods of conducting an accident investigation.
24. Structure of notification about aviation accidents.
25. Features of the group method of investigation an aviation accident.
26. The principle of multi-factoriality in the investigation.
27. Previous and final reports.
28. Aviation accident investigation final report form.
29. Signing the final report.
30. Directions for safety of flights recommendations.

Annex 8

Question of the intermediate test Q8

1. What is the atmosphere of the Earth and what is its structure?
2. What is pressure, static pressure and dynamic pressure?
3. What is the principle of Bernoulli?
4. What is the Venturi effect?
5. How does aerodynamic lifting force arise and on what factors does its value depend?
6. Aerodynamic air resistance and air density.
7. Boundary layer.
8. Airflow around dual aerodynamic surfaces.
9. What is drag, on what factors depends on its size and what are its components?
10. What is the effect of land influence, how does it manifest itself and how should it be taken into account when piloting an aircraft?
11. What is aerodynamic quality, what factors and how does it depend?
12. The balance of forces and moments acting on UAV.
13. Methods for achieving equilibrium UAV.
14. UAV controls in flight.
15. UAV control surfaces.
16. UAV control by pitch.
17. Control aircraft by roll.
18. Control aircraft by yaw.
19. Wing mechanization.
20. Disturbed calm airflow.
21. UAV characteristics when stall.
22. Factors influencing the rate of stall and the nature of changes in the parameters of the UAV during stall.
23. Stalling during horizontal flight, while climbing, descending and turning.
24. Exit from stalling.
25. Avoid spin.
26. Stability.
27. Longitudinal stability.
28. Transverse and longitudinal stability.
29. Interdependence, transverse and longitudinal stability.
30. Load factor and maneuvers.

Annex 9

Question of the intermediate test Q9

1. What is the phonetic alphabet in Russian and English?
2. What are call signs/abbreviations of station/aircraft?
3. What is the technical means to transfer?
4. What is an “aviation mobile communication”?
5. What is an “aviation fixed communication”?
6. What is an “aviation station”?
7. What is an “airborne station”?
8. What is an “transponder”?
9. What is the “main station”?
10. What is the “report from the onboard of the aircraft”?
11. What is the “collection of aeronautical information”?
12. What is the “blind transmission”?
13. What is “broadcasting”?
14. What services support the operation of aeronautical telecommunications?
15. Rules for transferring numbers in Russian and English, an exception to the rules for transferring numbers.
16. How to find in the collection of aeronautical information the frequency of the air traffic control (ATC) sector in which you plan to fly?
17. Standard words and phrases, meanings of standard words and phrases.
18. Radio communication technology.
19. Listening to the active radio channel, listening targets.
20. Radio testing, types of radio testing.
21. Dispatch resolution for departure. The structure of the dispatch permit, by which authority is issued?
22. Radio exchange in English and Russian languages when starting the engine/engines. Procedure for starting the engine/engines, depending on the situation.
23. Request for instructions on taxiing to the previous start. The procedure for performing taxiing, depending on the situation.
24. Radio exchange in English and Russian languages when performing the procedure of taxiing to the executive start. The procedure for performing taxiing to the executive start, depending on the situation. Getting permission to fly.
25. Radio exchange during the climb and descent procedure.
26. Traffic information on the ground and in the air. Rules and procedures for the transfer of information about the movement.
27. Radio exchange in English and Russian while flying UAV in the zone of turbulence. Request to change flight level.
28. Transmission and receipt of information about weather conditions. Obtaining information about circling thunder clouds.
29. Types and structure of broadcasting information.
30. The procedure and phraseology of radio traffic in case of loss of communication.

Annex 10

Question of the intermediate test Q10

1. Modern concept of flight safety.
2. The need for safety management.
3. The evolution of approaches about flights safety.
4. Modern ICAO requirements about guarantee of flight safety.
5. Basic concepts on which an acceptable level of flights safety is built.
6. Professor Ryzon's approach to civil aviation.
7. Composition of protective equipment in civil aviation organizations.
8. Active failures.
9. Hidden conditions.
10. The concept of causation of aviation incident.
11. Errors and violations.
12. Operational error concept.
13. Reduction strategy to control operational errors.
14. Interception strategy to control operational errors.
15. Tolerance strategy to control operational errors.
16. Situational violations.
17. Routine violations.
18. Optimization violations.
19. Hazard identification.
20. Risk control.
21. Flight Safety Management System.
22. Aviation incident.
23. Special situations.
24. Actions in special situations.
25. Turbulent wake.
26. Aquaplaning.
27. Wind displacement.
28. Takeoff.
29. Approach to landing.
30. Landing.

Annex 11

Question of the intermediate test Q11

1. The design of the UAV fuselage.
2. The design of the UAV wing.
3. The design of the UAV plumage.
4. The design of the UAV undercarriage.
5. Operation of the UAV fuselage.
6. Operation of the UAV wing.
7. Operation of the UAV plumage.
8. Operation of the UAV undercarriage.
9. The design of the UAV engine.
10. UAV engine fuel system.
11. UAV engine lubrication.
12. Operation of the UAV engine.
13. Starting the engine UAV.
14. UAV engine adjustment.
15. Control parameters of the engine UAV.
16. UAS crew.
17. Interaction technology between UAS crew members.
18. Responsibilities of UAS crew members.
19. Rights and obligations of the UAS commander.
20. Types of external pilot stations.
21. The design of the mobile station external pilot.
22. Operation of the external pilot mobile station.
23. UAV controls on the external pilot's mobile station.
24. Features of UAV control when using an external pilot mobile station.
25. The design of the stationary station external pilot.
26. Operation of a stationary station of an external pilot.
27. UAV controls at the stationary external pilot.
28. Features of UAV control when using an external pilot stationary station.
29. Interaction technology between UAS crew members when using an external pilot stationary station.
30. Responsibilities of UAS crew members when using an external pilot stationary station.