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Кафедра авіоніки

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‘ \_\_\_ ’ \_\_\_\_\_ 2021

**ДИПЛОМНА РОБОТА**  
(ПОЯСНЮВАЛЬНА ЗАПИСКА)  
ВИПУСКНИКА ОСВІТНЬОГО СТУПЕНЯ  
«БАКАЛАВР»

ТЕМА: **«Застосування веб-камери на онлайн заняттях  
з персоналом авіакомпанії»**

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Київ 2021

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
NATIONAL AVIATION UNIVERSITY  
FACULTY OF AIR NAVIGATION, ELECTRONICS AND  
TELECOMMUNICATIONS DEPARTMENT OF AVIONICS

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' \_\_\_\_ ' \_\_\_\_\_ 2021

**GRADUATION WORK**  
(EXPLANATORY NOTES)  
GRADUATE OF AN EDUCATIONAL DEGREE  
«BACHELOR»

THEME: **« Usage of the web-camera with airline staff in online  
class»**

Done by: \_\_\_\_\_ V. P. Konoval  
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Kyiv 2021

# NATIONAL AVIATION UNIVERSITY

Faculty of Air Navigation, Electronics and Telecommunications

Department of avionics

Specialty 173 'Avionics'

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'\_\_\_\_', \_\_\_\_\_2021

## **TASK for execution graduation work**

Viktor Konoval

1. Theme: 'Usage of the web-camera with airline staff in online class', approved by order №459/CT of the Rector of the National Aviation University of 23 March 2021.
2. Duration of which is from 10.05.2021 to 10.06.2021.
3. Input data of graduation work: Creation of a manual for online lessons. Choosing the right hardware and software, setting up equipment and getting started step by step.
4. Content of explanatory notes: List of conditional terms and abbreviations; Introduction; Organization of theoretical training of aviation personnel in airlines; Using applications for video conferencing (online classes); Workplace development; Experiment; Conducting an online lesson with airline personnel.
5. The list of mandatory graphic material: figures, charts, graphs.

6. Planned schedule

№	Task	Duration	Signature of supervisor
1.	Varification and validation of graduation work theme	18.02-26.02	
2.	Carry out a literature review	12.05-20.05	
3.	Develop the first chapter of diploma	21.05-23.05	
4.	Develop the second chapter of diploma	24.05-02.06	
5.	Develop the third chapter of diploma	02.06-05.06	
6.	Develop the fourth chapter of diploma	05.06-08.06	
7.	Tested for anti-plagiarism and obtaining a review of the diploma	09.06	
8.	Documents preparation for passing the graduation work	09.06-15.06	

7. Date of assignment: ‘ \_\_\_\_ ’ \_\_\_\_\_ 2021

Supervisor \_\_\_\_\_

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V. N. Bielinsyi

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The task took to perform \_\_\_\_\_

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V. P. Konoval

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## **ABSTRACT**

Explanatory notes to bachelor work 'Usage of the web-camera with airline staff in online class' contained 79 pages, 57 figures, 15 tables, 12 references.

**Keywords:** COMPUTER, WEB-CAMERA, ONLINE CLASS, MICROPHONE, AIRLINE STAFF, APPLICATION, WORKPLACE, DISTANCE EDUCATION.

**Object and subject of research** – using a camera in online lessons, creating a workplace for holding an online conference; personnel training methods, work and maintenance of computer equipment.

**Purpose of bachelor work** – explore new, distance learning methods and business meetings with airline personnel.

**Research Method** – solve this problem, the methods of decision-making theory, reliability theory, market analysis method, statistics theory, information theory and the method of expert assessments were used.

**Scientific novelty** – methods of new use of television equipment, as well as their components, recommendations and methods of using the equipment when using and their general impact on the educational system are proposed.

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## LIST OF ABBREVIATIONS

Webcam	Web-camera
PC	Personal Computer
Micro	Microphone
Wi-fi	Wireless internet
APP	Application
VAS	Voice Activated Switching
AT	Aviation technique
AS	Airline staff
CA	Civil aviation
AES	Aviation engineering service
TM	Technical maintenance
ETP	Engineering technical personel
EAS	Enhanced Avionics System
ATA	Advanced Technology Attachment
DAU	Data Acquisition Unit
FD	Flight Decoder

## INTRODUCTION

Conducting classes remotely, not being able to explain in person and help at the time of the problem - a new problem that we encountered 2 years ago, and could not imagine such situations in their work. But the pandemic contributed unexpected adjustments and forced everyone to urgently master digital tools and new pedagogical approaches and techniques.

Forced distance learning has become a challenge for everyone participants in the educational process: coaches, airline staff.

Organize quality training using digital technologies, motivate, give advice to technical problems was not easy.

Distance learning is an individualized process of acquiring knowledge, skills, abilities and ways of human cognitive activity, which occurs mainly through the indirect interaction of distant participants in the training process in a specialized environment that operates on the base of modern information and communication technologies.

Distance learning involves access to the Internet, technical support (computer, tablet, smartphone, etc.) for all participants in the educational process, as well as the fact that leader of have lessons distance learning technologies.

In this explanatory note, guidelines consist of four chapters.

In the first chapter the general principles of theoretical preparation for distance education.

The second chapter provides information on tools and platforms on which to learn remotely.

The third chapter is devoted to specific methods of developing a distance learning workplace.

The fourth chapter contains information about using the Google Classroom application and conducting a distance lesson using this program.

The generalized experience of almost two years distance learning during quarantine due to a pandemic coronavirus suggests that this experience all of us still needed.

In addition, the world is becoming more mobile, education is becoming more individualized and flexible; therefore, new and new reasons arise every day for the need to have distance learning skills.

These guidelines will be useful in teaching, with which you will gain new knowledge, habits, and practical skills.

## CHAPTER 1

### ORGANIZATION OF THEORETICAL TRAINING OF AVIATION PERSONNEL IN AIRLINES

#### 1.1 Prospects for the development of educational technologies in the training of aviation personnel.

At present, special attention of the scientific and industrial community is paid to the training of aviation personnel, whose high qualifications are the key to safety in civil aviation.

The main distinguishing features of the training of aviation personnel are the high cost training, regulation of the content of training programs, the need for regular confirmation of professional qualifications, acquisition of new and updating existing knowledge and skills, improvement of professional skills, continuity of professional training in the process.

Aviation personnel are trained by higher and secondary educational institutions of civil aviation.

Secondary educational institutions (colleges and schools) are structural subdivisions of higher educational institutions.

Since the work of aviation personnel is directly related to ensuring safety, the search for new educational technologies and approaches that improve the quality of training is of particular relevance.

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The purpose of the work is to show possible prospects for the use of new educational technologies in training aviation personnel

Effective training of aviation personnel is possible using modern educational technologies that improve the quality of education and reduce transaction costs.

Traditional educational technologies in the training of aviation personnel are lectures, workshops (seminars), consultations, etc.

Currently, interactive forms of education are gaining increasing popularity.

A possible mechanism for solving the problem of ensuring high quality personnel training for civil aviation is the creation of new educational programs.

It should be noted the need to use online training and distance learning technologies in the training of aviation personnel. The use of these educational technologies will allow listeners to master the content of the courses remotely. This will reduce the direct costs of training, retraining and advanced training of personnel sent by air transport organizations to educational institutions, as well as the time spent by the personnel themselves.

In the modern world, the use of online courses is becoming more and more popular. Digital technologies in education presuppose the emergence of large online educational platforms. Gadgets, instant messengers and other applications on personal devices, which can also be used for educational purposes, began to play an important role in the learning process.

To solve this problem, it is necessary to develop, implement and use modern educational technologies to develop the labor potential of personnel, to train competitive specialists who meet the needs of the industry.

## 1.2 Forms and methods of theoretical training of aviation personnel in airlines

Nowadays, training of airline personnel to work with various types of equipment and software is very important for the operation of an enterprise. Not all employees have the knowledge of working with specific equipment, and everyone needs to be trained. Therefore, clarification of the meaning invested in all concepts intended for use and associated with personnel training is the first necessary step in the formation of a personnel training system.

Educational material	Forms of personnel training	Principles of teaching	Motivate factors	Practice training methods
1 Manuals; 2 Maintenance instructions; 3 Schematic brochure; 4 Video manuals; 5 Technical descriptions; 6 Training stands.	1 Lecture 2 Seminar, conference 3 Training 4 Self-study 5 Blended study	1 Relevance 2 Participation 3 Repetition 4 Feedback	1 The desire to keep the job, to stay in the position; 2 Desire to get a promotion or take a new position; 3 Interest in increasing wages; 4 Interest in the very process of mastering new knowledge and skills; 5 Desire to establish contacts with other program participants.	1 Copying 2 Briefing 3 Apprenticeship and mentoring

Table 1.1 Description of forms and methods of studying.

This greatly facilitates understanding, aids in the speedy acquisition of skills and facilitates communication between staff. Preparing the educational process, creating plans, discussing the way of presenting information, gives 50% success in training personnel during training.

But first of all, you need to decide on the choice of literature, which will be used to train personnel.

Information that can be presented as educational material can be found in:

- Manuals;
- Maintenance instructions;
- Schematic brochure;
- Video manuals;
- Technical descriptions;
- Training stands.

Forms of personnel training at the enterprise:

1. Lecture (presentation) - a passive form of teaching, which is used to present theoretical, methodological knowledge. Learning to apply the information received in practice. In this process, managers and qualified specialists of the enterprise or external lecturers act as lecturers.

2. Seminar, conference - an active form of training, the topic, as a rule, is known in advance. Listeners exchange views, ask questions, challenge each other. The coach will moderate the meeting. The seminar is usually held after the lecture to consolidate the material covered. Participate in seminars develops logical thinking and develops ways of behaving in various situations.

3. Training is an active form of training, the purpose of which is to develop certain skills in the employee.

In many ways it is similar to a seminar, but instead of theory, there is more practice - the participants of the training use the knowledge gained. Trainings are mainly used to prepare beginners.

4. Self-study is an individual, independent form of education. It can be carried out by the employee himself, both at home and at the workplace, with the availability of educational material, manuals, video tutorials.

5. Blended study - learning that combines several of the types discussed above. For example, you can first study the entire theory online by reading the material in any place convenient for the employee. After that, already at a face-to-face meeting, the trainer does not waste time on methodology and focuses on practice.

You should also pay attention to the amount of information and the time of one lesson, it should be 40-50 minutes, since after this time the human brain gets tired and does not perceive information well.

There is also a reverse method of blended learning in which a face-to-face lesson with an instructor takes place, and then they study an electronic course and take a test. At the same time, all remote materials remain in the public domain. Employees can study them at any time: on the way home or at lunchtime.

When choosing teaching methods, the organization should, first of all, be guided by the effectiveness of their impact on a specific group of listeners. In this case, 4 principles must be taken into account:

1. Relevance. What is said during the training should be directly related to the topic of the lesson;
2. Participation. Listeners should actively participate in the educational process and directly use new knowledge and skills already in the course of training;
3. Repetition. It helps the new to gain a foothold in the memory and turns the acquired skills into a habit;

4. Feedback. Employees need to be constantly provided with information about their learning outcomes. The presence of such information allows them to coordinate efforts to study previously unpicked information in order to achieve better results in their work.

Studies show that the success of a vocational training program is 80% dependent on its preparation and 20% on the willingness and ability of the trainees.

Education will be equally ineffective if treated as "paid vacation" or as "punishment." Therefore, the human resources department should pay special attention to creating an appropriate attitude towards the planned training. The following factors can motivate employees to actively participate in a professional training program:

- The desire to keep the job, to stay in the position;
- Desire to get a promotion or take a new position;
- Interest in increasing wages;
- Interest in the very process of mastering new knowledge and skills;
- Desire to establish contacts with other program participants.

There are a huge number of methods for developing professional knowledge and skills. All of them can be divided into two large groups - training directly in the workplace and training outside the workplace (in the classroom).

On-the-job training is characterized by direct interaction with normal work in a normal work situation. Such training can be carried out in three methods:

- Copying - the employee is attached to a specialist, and learn by copying the actions of this person. All procedures are performed at one workplace, the instructor gives prompts, thereby accelerating the assimilation of information and helps the employee, if necessary, in case of problems.
- Briefing - is an explanation and demonstration of working techniques directly at the workplace and can be carried out both by an employee who has been performing these functions for a long time, and by a specially

trained instructor. The briefing is, as a rule, short-lived, focused on mastering specific operations or procedures that are part of the listener's professional responsibilities.

- Apprenticeship and mentoring - are the traditional methods of vocational training for artisans - since ancient times, working alongside a foreman, young workers have studied the profession. This method is widespread today, especially where practical experience plays an exceptional role in the training of specialists - repairing, piloting with instructor, management, etc.

### **1.3 Technical training of aviation personnel**

Aviation Technical Training ITP AES CA is intended, first of all, to ensure technical readiness and grant, on this basis, the right to a specialist to perform certain functions, or specific types, complexes of work (for performers with self-control - without presenting the work to the control engineer, i.e. under personal responsibility), as well as control the quality of work performed on the AT by other ITP employees who do not have a document (admission) and working under the authority of a certified specialist or attached to him.

The main forms of ITP qualification improvement are:

- Current technical training;
- Seasonal training;
- Conferences and seminars;
- Refresher courses for aviation technicians (mechanics);
- Refresher courses for engineering staff (shift engineers, shift supervisors, senior shop engineers, etc.);
- Refresher courses for management personnel (from the head of the shop and above) and training of a personnel reserve;
- Self-training.

Ongoing technical training takes place directly with airlines (Organizations for TM of AT) operating civil aircraft and provides for:

- Operational study of the incoming normative, technical and guidance documents regulating the activities of the AES CA; detailed study of AT design changes from industry bulletins and the order of their implementation;
- In-depth study of the most critical and complex systems, assemblies, units and AT products, the rules for their operation and TM;
- Study of the causes of AT failures and damages, methods of their detection, elimination and prevention;
- The acquisition of practical skills to perform new types of work and operations, provided for by the newly received documentation.

The volume of training is 6 hours per month, if necessary - up to 10 ... 12 hours per month.

Seasonal technical training is carried out twice a year at the rate of 8 ... 10 hours per month:

- In preparation for the autumn-winter period - until October;
- In preparation for the spring-summer period - until April.

Seasonal training includes:

- Analysis and study of the operational experience of the aircraft of the given enterprise and the aircraft in general for the corresponding periods of previous years;
- Repetition of labor protection and fire safety rules for tm of at;
- Holding conferences for the exchange of experience in operating with at;
- Participation in flight technical conferences of an aviation enterprise (airline).

During these periods, seasonal and current studies, as a rule, are combined and, according to the general plan, does not exceed 10 hours per month. These types of training are carried out according to standard programs. The most trained command and control and engineering staff are involved in the training.

Conferences and seminars are held to analyze and summarize the experience of operating aircraft and determine measures to improve their reliability, to study progressive forms of labor and exchange best practices.

Refresher courses for aircraft technicians (mechanics) organized at aviation training centers (allowed directly in airlines):

- With a three-week training period for specialists serving second-class aircraft;
- With two weeks - third and fourth grades.

Each aircraft technician (aircraft mechanic) must complete the specified courses, at least once every three years.

Advanced training of the engineering staff is carried out at CA universities with a monthly training period and a frequency of at least once every six years.

The management staff of AES undergo advanced training courses at universities of the CA with a training period of up to two months at least once every six years.

Self-training is one of the main forms of improving the professional training of aviation specialists and is carried out both according to personal plans and according to the individual plans of direct supervisors.

The responsibility for the state and organization of the aviation technical training of the ITP rests with the heads of enterprises (Organizations for TM of AT). General control over the level of professional training of aviation personnel in the aircraft is assigned to the highest qualification commission.

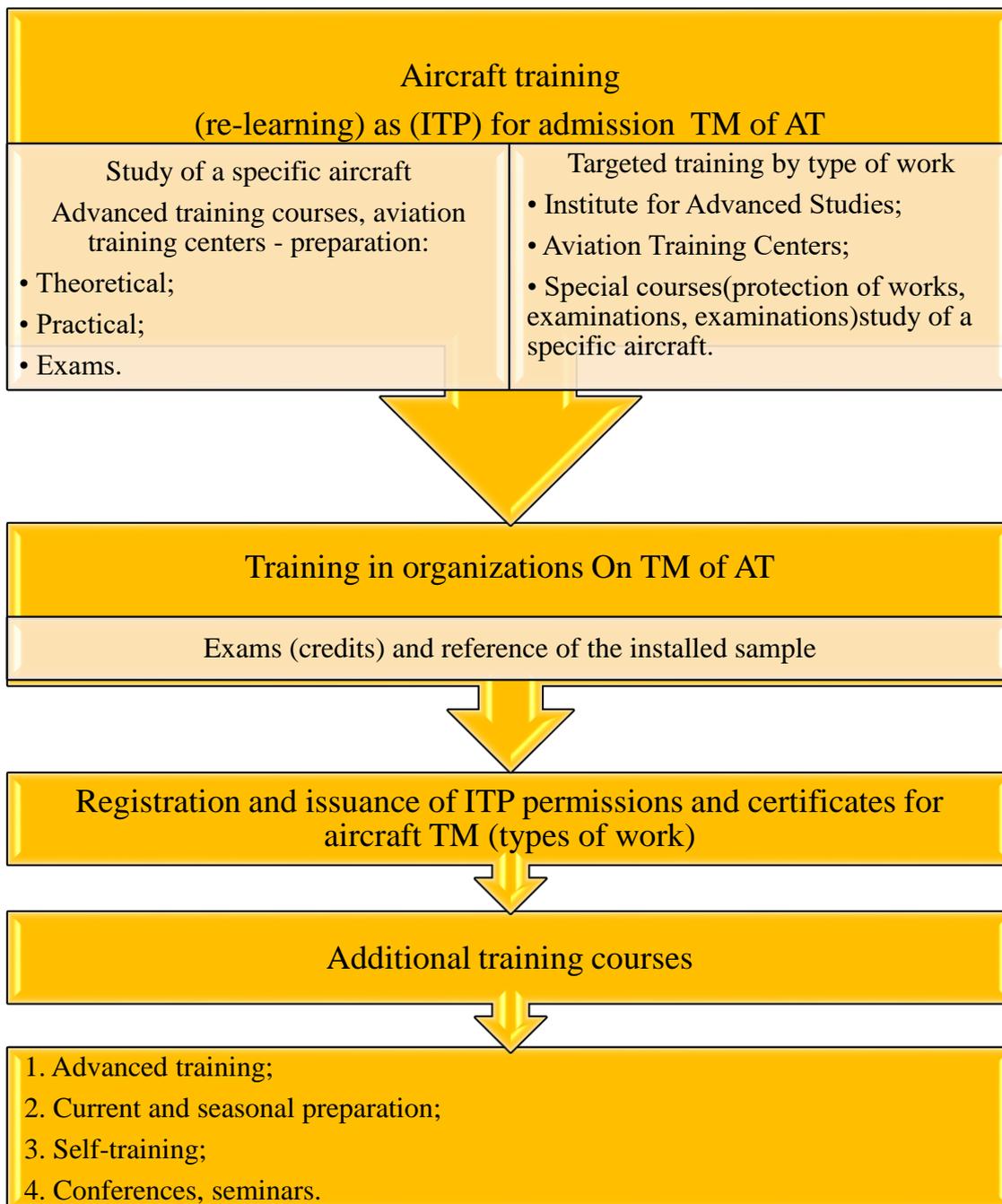


Table 1.2 Structural scheme of personnel training

#### **1.4 Analysis and selection of applications for conducting classes with aviation personnel on-line.**

After training the personnel and acquiring the appropriate skills in using the computer and the equipment connected to it, it is time to choose the hardware

and software that is suitable for the airline's needs for regular, high-quality and reliable communication with the personnel remotely.

To begin with, we will choose a platform on which we will conduct online meetings, business conversations and classes.

The application should be modern and feature-rich, since most legacy programs broadcast only audio and video, which remains at the cellular level.

Among the programs there are such suitable for work as:

## 1. Zoom

Platform tools: whiteboard, the ability to present material visually, chat, "raise your hand", "applause", change the background or record a video message, as well as mute and video functions, both for the participants and the head of the online conference. The APP provides a video telephony service that allows you to connect up to 100 devices simultaneously for free, with a 40-minute limit for free accounts.

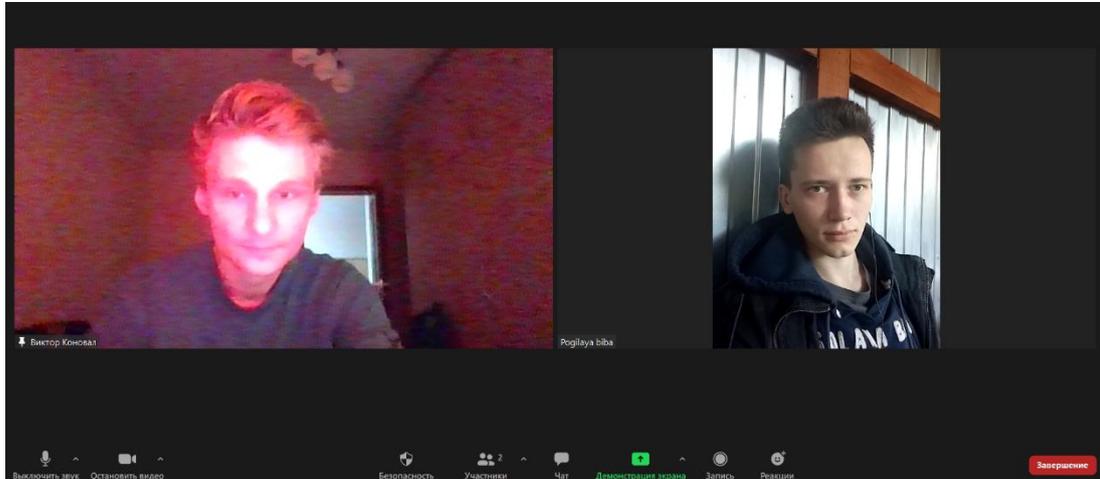


Fig.1.1 Screenshot of Zoom

## 2. Microsoft Teams

Platform toolkit: whiteboard, the ability to present material visually, chat, "raise your hand" function, chat group in which you can correspond and not during the

meetings. Microsoft Teams is part of the Office 365 suite and is distributed through a corporate subscription that a company can buy for its internal needs for a period of one year or more.

### 3. Google Meet (Google Classroom)

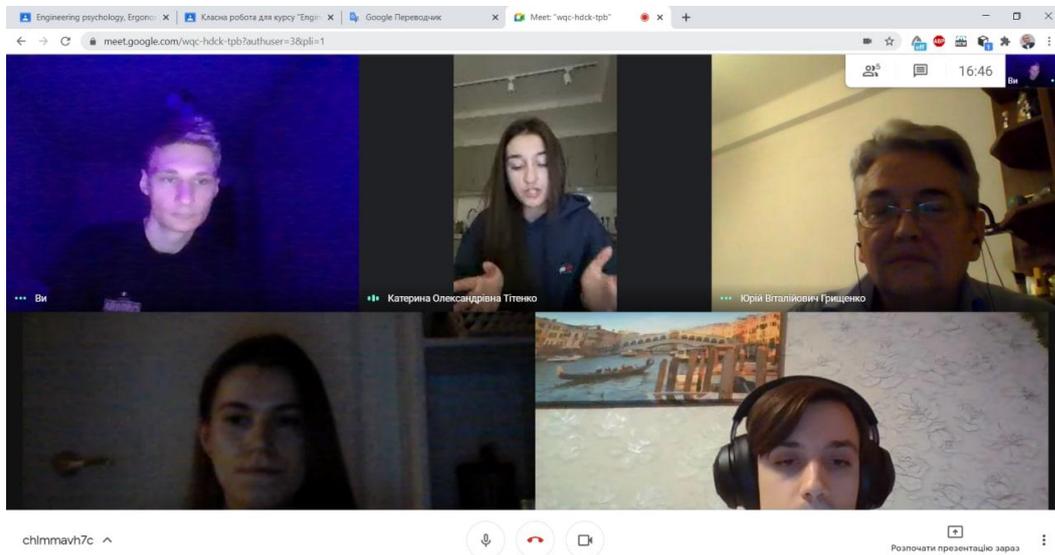


Fig.1.2 Screenshot of Google Classroom

Platform toolkit: whiteboard, the ability to present material visually, chat, the function "raise your hand", chat, as well as mute and video functions; the ability to connect to Google Classroom for convenient and quick distribution of information, materials, tasks to each employee or separately.

### 4. Skype

Platform toolkit: the ability to present material visually, chat, subtitles for people with hearing impairments. Skype is an outdated program, although many people still use it for business online meetings. At the moment, there is a more advanced program from Microsoft, which is mentioned above. And so, among the programs listed above, I can recommend the Google Meet and Microsoft Teams, since they are free, practical and multifunctional, the Telegram

application can serve for general and urgent collective information when the computer is not available.

### 5. Telegram

Platform toolkit: a chat group in which you can communicate, even not during meetings, as well as the advantages of this application can be attributed to its popularity, so that you can quickly contact with all colleagues, even in situations when the computer is not available.

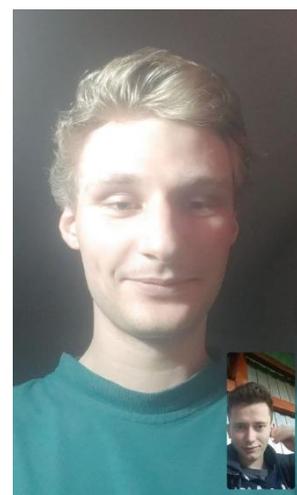


Fig.1.3 Screenshot of Telegram

	App name	Characteristics
1	Zoom	Present material visually, whiteboard, chat, "raise your hand", mute, "applause", change the background.
2	Microsoft Teams	Present material visually, whiteboard, "raise your hand", chat.
3	Google Meet	Present material visually, whiteboard, chat, "raise your hand", the ability to connect to Google Classroom
4	Skype	Present material visually, chat, subtitles for people with hearing impairments
5	Telegram	Chat, quick contact outdoors

Table 1.3 Applications characteristics

### 1.5 Analysis and selection of hardware and software for conducting classes with aviation personnel on-line.

Having chosen the program in which we are going to conduct video calls, we should choose equipment for online classes and meetings. We need to choose a video camera, a microphone, and, depending on needs of company, choose an output audio device, it can be both headphones and speakers, if the meetings are held for a group of people. In order for the video stream picture to look beautiful and clear, and the sound to be interference-free and of high quality, we need to choose the non-built-in audio and video input devices, since the available

devices in the laptop do not satisfy us in quality. To do this, we need to be guided by several important factors:

1. The quality of the product;
2. Low cost;
3. Reliability, durability of work;
4. Ease of use.

First of all, we need to have a device with the help of which we will conduct our online classes – PC. There are so many characteristics of it, but several of them is really important:

Recommended parameter	Value
PC type	Nettop Vinga
Processor series	Intel Celeron J4105
Video card model	UHD Graphics 600
The amount of installed memory	4 GB
Types of internal storage	SSD 64 GB
Wired network (LAN)	10-100 Mbit / s

Table 1.4 Characteristics of PC.

The most suitable PC for our needs is Vinga Mini PC V500. Second and very important device is display, its characteristic is:

Recommended parameter	Value
Display diagonal	23.8 "
Refresh rate	75 Hz
Maximum display resolution	1920 x 1080
Matrix response time	5 ms
Display brightness	200 K / m <sup>2</sup>
Matrix type	TN
Aspect ratio	16: 9
Connector	HDMI cable

Table 1.5 Characteristics of monitor

The right monitor in terms of performance and price and quality 23.8" Samsung F24T350FHI Dark Gray.



Fig.1.4 Image of monitor



Fig.1.5 Image of PC block

Before choosing a webcam, it is important to know about several main criteria for its selection. To make the best choice from a wide range of cameras, look at the specifications.

Better to have an external USB webcam. It can be located both, on a tripod and on a table with a special leg, or on a computer monitor.

The camera must have a high image resolution, from 1080p to 4K. Resolution determines the quality of the images. Standard 720p is no longer a bad performance. But anything smaller on the recording will give you a very blurry picture.

More frames per second. If you go for the most budget camera with 7-10 frames per second, you will get an image that is transmitted in jerks. 30 frames per second is enough for conducting classes. Since for the human eye, the perception of a smooth picture has begun at a frequency of 20-25 frames per second.

Good autofocus so that no matter your movements, head or body position, the image will be clear. Viewing angle from 60 degrees to 90 degrees.

Recommended parameter	Value
Video quality	1080p
Frame rate	30 fps
Viewing angle	60°-90 °
Type of a connection	USB port
Tupe of installation	Tripod

Table 1.6 Characteristics of camera

A good and budget example of a camera that is mounted on a computer monitor could be the Defender G-lens 2597 HD720p. The same or similar camera by characteristics can be used in online classes.



Fig.1.6 Image of camera



Fig.1.7 Image of micro

After choosing a camera, we move on to choosing a microphone, here the task is a little more complicated. The microphone can be located either as a separate device on a table, tripod, tripod, attached to a monitor or wall nearby, or built-in, for example, into headphones, a previously selected camera or into a laptop computer itself. It is also desirable that the microphone is with a USB connector. With an operating frequency range of 20-20000 Hz and a sensitivity of 6-10 dB. The special function of noise suppression and manual selection of the microphone sensitivity will also have a positive effect, for example, if it is very noisy in the cabinet or a window is open.

Recommended parameter	Value
Operating frequency range	20-20000 Hz
Sensitivity	6-10 dB
Type of a connection	USB port
Tupe of installation	Tripod

Table 1.7 Characteristics of micro

SPEEDLINK Capo USB Desk and Hand Microphone Black (SL-800002-BK) can be a good budget and multifunctional microphone for installation on a table as well as with the ability to carry in the hand.

After choosing a microphone, we move on to choosing an output audio device, it can be like headphones with a microphone or speakers. Headphones are beneficial only if the session is held in a noisy room, so that each member of the staff listens only to the information that is intended for him, in addition, it helps to save money on the purchase of a microphone, since it will be built into the headphones and brought close to the mouth. On the contrary, speakers will be needed when a meeting is held for a large audience of people, in a large room.



Fig.1.8 Image of headphones



Fig.1.9 Image of speakers

Headphones should have a 3.5mm plug, equipped with a sufficiently long wire, preferably about 1m. With an operating frequency range of 20-20000 Hz and a sensitivity of 6-10 dB. On one side, a special bracket should be installed in

which the microphone will be located, which can be conveniently brought to the mouth during speech, or moved away so that it does not interfere.

Recommended parameter	Value
Plug size	3.5 mm
Sensitivity	6-10 dB
Operating frequency range	20-20000 Hz
Wire length	1m
Other functions	Micro is installed

Table 1.8 Characteristics of headphones

SVEN AP-525MV is an excellent budget version of headphones with an adjustable microphone, with a long wire and a volume control for complete convenience during work.

After choosing the headphones, we turn to the choice of speakers, we will consider them only for the situation when the lectures will be held for a large audience. One pair of speakers can save the company money, as many pairs of headphones are much more expensive. On the contrary, speakers will be needed when a meeting is held for a large audience of people, in a large room.

Speakers should have a 3.5mm plug, equipped with a sufficiently long wire, preferably about 1m,

as well as a manual volume control. And with a total power of at least 5W.

Recommended parameter	Value
Plug size	3.5 mm
Power source	220 V or USB 2.0
Power	5 W
Operating frequency range	20-20000 Hz

Table 1.9 Characteristics of speakers

The Kisonli K100 is a good, inexpensive speaker option that can be replaced with a variable volume, with a long cable for complete ease of use.

## **Conclusion to chapter**

To train airline personnel, you must first choose a training method that directly depends on the listeners themselves. After choosing a methodology, we select software and hardware with which online classes will be conducted. These are a microphone, webcam (создать примечание), headphones, or speakers, depending on situations and curriculum requirements. As a result, we have two configurations of working equipment:

1. Camera, microphone, speakers;
2. Camera, headphones with microphone.

The first configuration is suitable for group lessons, when 2 or more people are listening to a lecture at the same time, the three configuration is suitable for individual training, or in a noisy work environment.

## CHAPTER 2

### USE OF SYSTEMS AND DEVICES FOR VIDEO CONFERENCE (ONLINE CLASSES)

#### 2.1 Video conferencing mode

A video conference is a communication session between two users or a group of users, regardless of their location. The number of participants displayed on the screen directly depends on the conference mode and on the user's role in the current conference.

There are four modes of video conferencing:

- Video call (point-to-point) (Fig.2.1);
- Symmetric conference (all participants on the screen) (Fig.2.2);
- Voice-activated video conferencing (Fig.2.3);
- Video lesson (all participants see and hear the lecturer, and the lecturer sees and hears everyone) (Fig.2.4);
- Conference call (all participants see and hear only the presenters) (Fig.2.5).

#### 2.2 Types of video conferencing

Various peripheral equipment is used to provide participants with sound and video: cameras, screens, microphones, speakerphones, headsets, congress systems and projectors. As a data transmission medium, both the enterprise network, built on various principles, and the global Internet can be used.

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Modern video and audio codecs, specialized network protocols, various signal processing algorithms make it possible to achieve high-quality communication on almost any communication channel.

Often during a video conference, a demonstration of various media data is necessary, for this video conferencing systems allow you to capture and transmit presentations to remote participants, an image of the desktop or its individual windows, as well as documents of various formats. This is achieved through the use of special software, additional cameras (for example, documentary cameras), signal capture from the video outputs of laptops, PCs and other systems, including medical complexes.

### Types of video conferencing

There are two main types of video conferencing - personal and group. Personal video conferencing means a video communication session in which only two subscribers participate. Group video conferencing refers to all other types of video conferencing. Various well-established rules for displaying participants in a video conference for each of the parties are called types of video conferences.

### 1-to-1 video conferencing

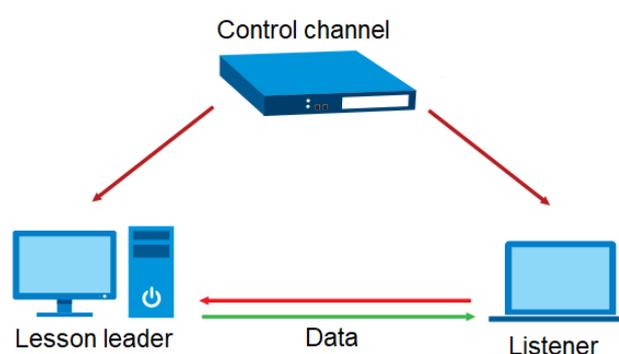


Fig.2.1 Scheme of video conferencing connection

Everything is simple here: two subscribers participate, both see and hear each other at the same time. Let's make a reservation right away that during any video

conference session, various collaboration tools can be used, such as the exchange of text messages, files, presentations and other media data.

### Symmetric video conferencing

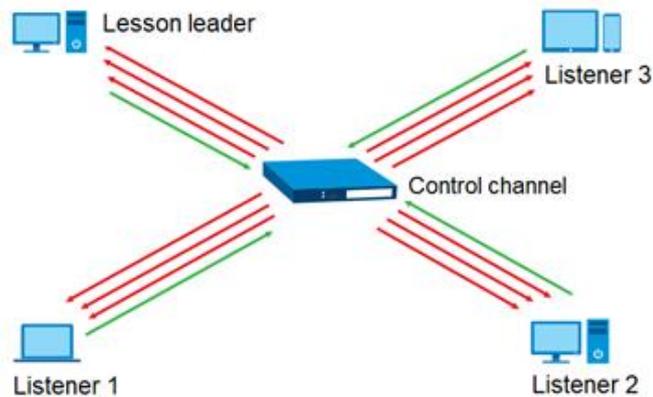


Fig.2.2 Scheme of Symmetric video conferencing connection

They are video conferencing with constant presence, from the English.

Continuous Presence. This is the name of a video conference session in which more than 2 people participate and all participants see and hear each other at the same time. Naturally, video conferencing implies full duplex communication. In other words, it is analogous to a round table where everyone has equal rights. Group video conferencing is suitable for meetings where the maximum involvement of each participant is required.

### Voice-activated video conferencing

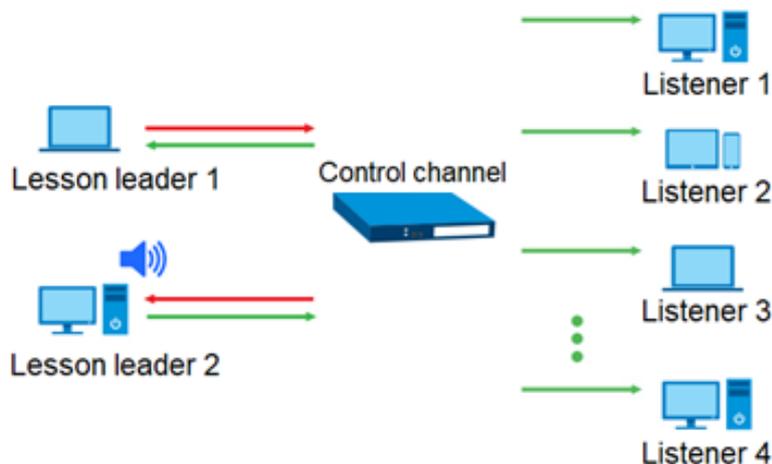


Fig.2.3 Scheme of Voice-activated video conferencing connection

The name of this mode comes from the English designation VAS. This video conference assumes the following communication format: all participants in the session hear and see on their screens only the speaking speaker, while he sees himself or the previous speaker. Small variations of this mechanism are possible, but the essence remains the following: the video conferencing server monitors the voice activity of subscribers and switches the image broadcast to all participants to the speaker. This mode has significant drawbacks, for example, false alarms for noise, cough or mobile phone ringing.

### Selector videoconferencing

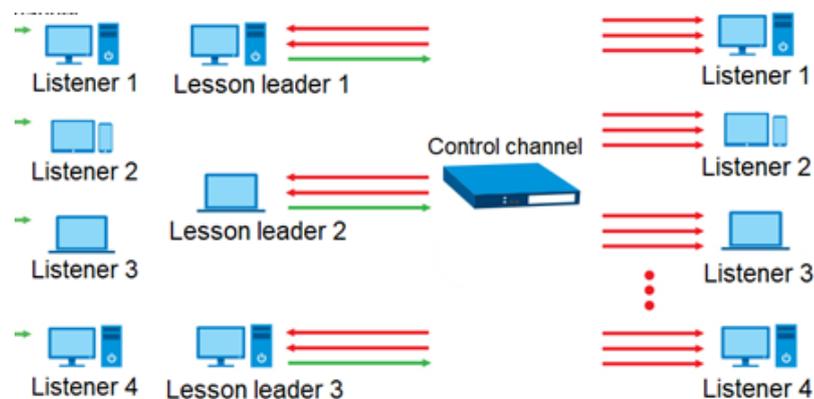


Fig.2.4 Scheme of Selector videoconferencing connection

A mode in which participants are divided into two types: speakers and listeners, where each of the listeners can become a speaker (with the permission of the conference organizer). The host of such a conference, appoints the speakers himself and can remove them from the video rostrum at any time.

This mode can also be called role-based video conferencing. Selector videoconferencing is used most often when conducting web conferences (webinars).

## Video conferencing for distance education

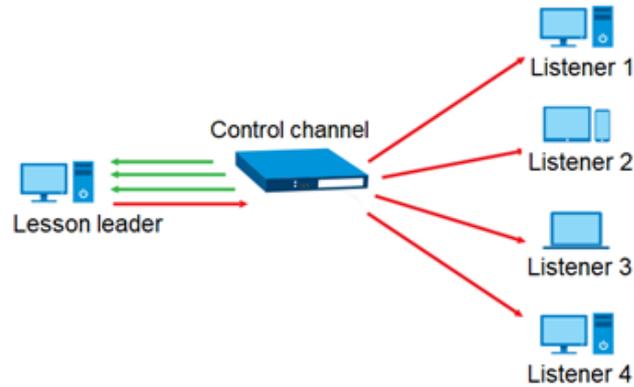


Fig.2.5 Scheme of Video conferencing for distance education connection

A special mode in which all participants (listeners) see and hear only one broadcasting user (instructor), and he sees and hears all visitors. Listeners are not distracted by each other, and the tutor controls them.

## Video broadcast

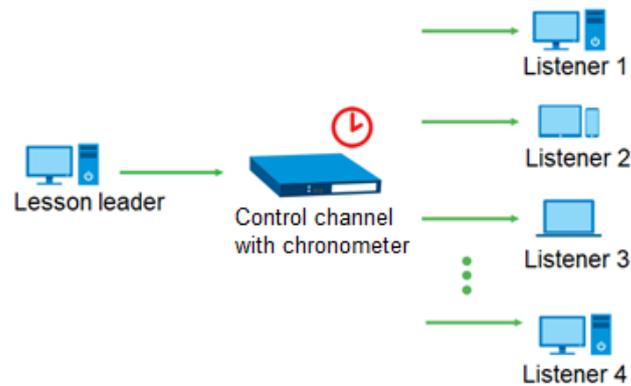


Fig.2.6 Scheme of Video broadcast connection

A type of video conference in which the speaker broadcasts to a wide audience of airline staff, while he does not see or hear them. The rest of the participants see and hear only the presenter. Feedback is possible only through text chat. Often, in order to smooth out changes in network conditions, during the broadcast, a significant delay of up to several seconds is introduced between the broadcaster and the listener.

## 2.3 Equipment for video conferencing

Depending on the location and method of connecting to a video conference session, different peripheral equipment may be required.

Let`s consider a video conferencing in a meeting room (congress hall).

In order to equip a meeting room with high quality devices, many nuances must be observed. Naturally, the more there are, the higher the cost of training. First of all, it is necessary to correctly calculate and install the sound reinforcement system. If the hall is small, then it will be enough to install one or several speakerphones (these are special devices that combine one or more microphones and speakers, and are designed to eliminate echo and noise).

Next, you need a PTZ video camera, it differs from the usual one by the ability to rotate, tilt up and down, as well as zoom in and out. Such a camera can, in both manual and automatic modes (this requires special equipment), switch between the faces of the speakers and the audience. As a display system, it is recommended to use two large diagonal LCD screens: one for video of participants, and another for presentations and other content.



Fig.2.7 Example of Video broadcast equipment (tracking camera)



Fig.2.8 Image of multifunctional camera

Well, not the last place is occupied by the interior of the room: good illumination, contrasting, but not bright background on the walls, noise-absorbing panels and so on. As you can see, the cost of equipment for a meeting room, depending on the chosen video conferencing solution, peripheral equipment and decoration, can differ by an order of magnitude.

There are already many ready-made sets and complexes that include everything you need, but taking up extra space on the table. Therefore, often, and also for the sake of the economy, a regular working PC is used as a video conferencing terminal, since there is no difference in quality, with the right choice of peripherals, between it and specialized hardware systems.

One good example of a conference suite for a 14-20 person room is the LOGITECH GROUP camera, which has a built-in microphone and a pivoting camera for the person who is speaking and has excellent picture and sound characteristics.

Recommended parameter	Value
Maximum video quality	1920x1080 Full HD
Maximum frame rate	30 fps
Rose connection	USB
Fastening	Tabletop
Focusing	Auto
Coot look around	90 °
Length of cable	5 m
Frequency response: 100 Hz - 11 kHz	Frequency response: 100 Hz - 11 kHz
Sensitivity: -28dB +/- 3dB	Sensitivity: -28dB +/- 3dB
Distortion: <5% at 200Hz	Distortion: <5% at 200Hz

Table 2.1 Characteristics of multifunctional camera

To prepare your PC for a video conference session, you need a good webcam (see the list of our recommended equipment), unfortunately, most cameras built into all-in-ones and laptops are not suitable for video conferencing. A headset

(preferably a USB headset) or a portable speakerphone connected to a PC via a USB interface.

### 2.3.1 Mobile video conferencing

One of the benefits of video conferencing is its portability. They can be used even while traveling or **on the go**. A device that can act as a video conferencing terminal - a smartphone, tablet, or even a watch. It is enough to install a special application for them. The manufacturers of these devices have already taken care of everything else: a front camera, a powerful central processor, hardware support for video codecs (which is also needed for watching movies or YouTube), but a good speaker and microphone are a matter of course. This method of videoconferencing will allow you to be always in touch with your colleagues, business partners, friends or relatives, regardless of the circumstances.

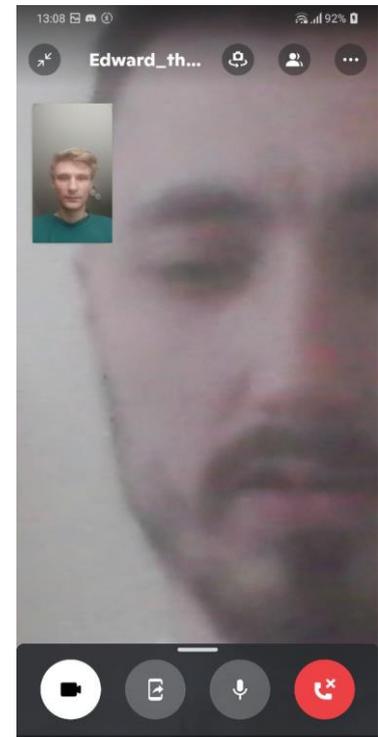


Fig.2.9 Screenshot of Discord

On the other hand, there are a number of complexities associated with mobile video conferencing, some industries still have to solve to make them truly convenient and popular, like on a PC.

### 2.4 Testing the web camera image

Having chosen the equipment and having adjusted the communication system in which the online lesson will be held, we must make sure of the quality of the video camera settings. The usual software diagnostics is not enough, since the program cannot assess the quality of the image that comes through the lens to the matrix, so we have to check it manually.

The quality of the picture is affected by the resolution of the camera, as well as the quality of the correction of the frequencies of the color palette.

The difference between the gamma correction modes also affects the image quality the display of the illumination of objects may differ on the screen and in real life.

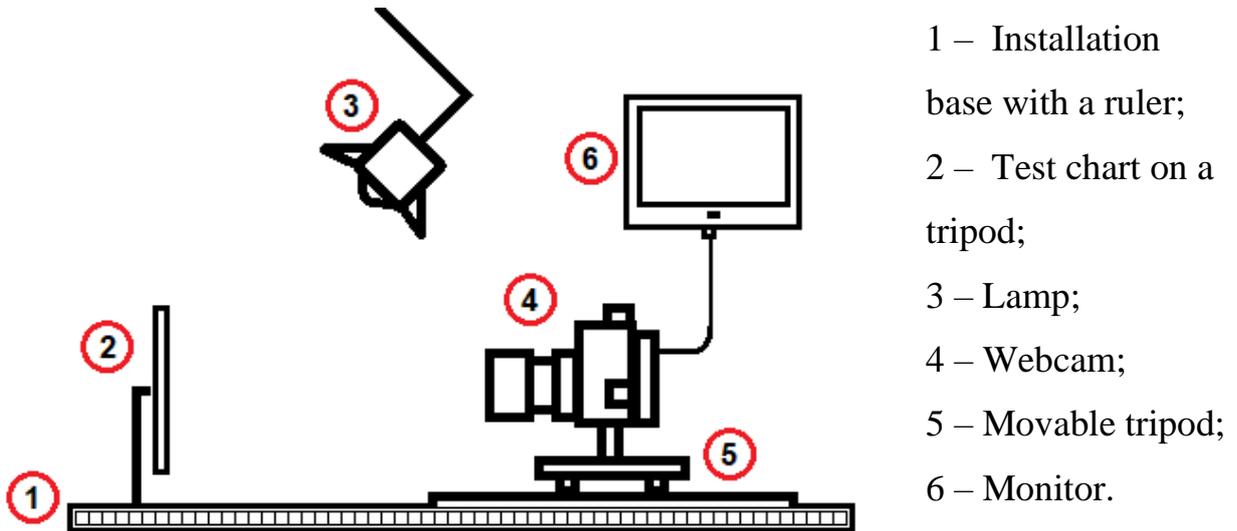


Fig.2.10 General scheme of the testing mounting

Rules for performing a video camera test:

1. Install the camera on a tripod;
2. Disable all automatic modes;
3. Disable special image processing;
4. Provide the best mode for the lens;
5. Install correctly, uniform lighting with a standard color temperature in the room;
6. Use a high-definition reference video monitor;
7. Mandatory instrumental control using a television oscilloscope and vectorscope;
8. Using "real" test charts from reputable manufacturers;

9. Establish a reference table, compare the quality of the picture with the original;
10. Repeat the procedure with all available test patterns;
11. Critical attitude to the results obtained.

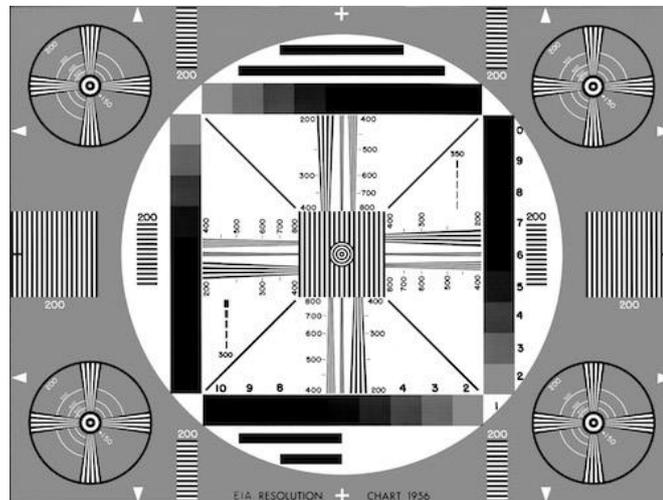


Fig.2.11 EIA1956 Universal Table

Basic image rating table for standard definition systems. Comprehensive assessment of resolution, contrast / dynamics in the luminance channel.

Contains:

- Center and corner circles for evaluating geometric distortion.
- Horizontal and vertical gray gradation wedges  $d = 0.15 \dots 1.50$  with a step of 0.15.
- Dashed wedges with a smooth transition 200 ~ 800 TVL,
- Reference dashed targets 200 TVL across the entire field. - Diagonal lines for interlaced control.

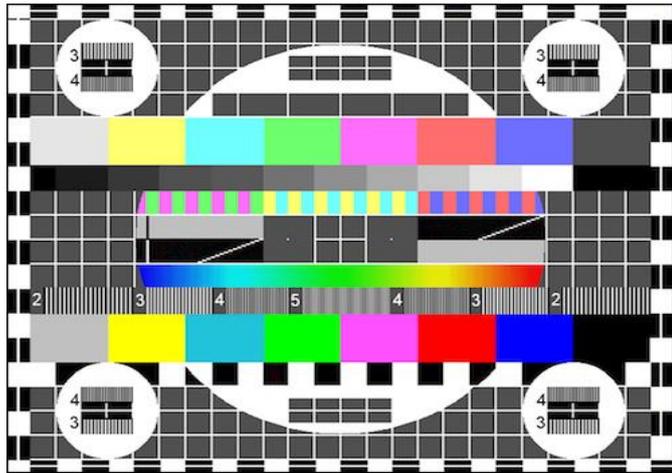


Fig.2.12 Universal Electronic Test Chart (UEIT)

Universal measuring table for SECAM standard devices. Evaluation of resolution, calorimetry, contrast, frequency response, information, etc.

Main parts: Grid field - table background. Allows you to customize the convergence of rays, and also visually breaks the table into rows and columns. Circles to control the geometric distortion of the raster. In the center of the circles there are crosshairs to center the image and to adjust the convergence. Color bars at 75% and 100% saturation for color control. Gray scale for adjusting the clarity of color transitions. Smooth color transition to check the linearity of the chroma channel. Vertical strokes in small circles for evaluating resolution and dynamic focus. They are formed by sinusoidal signals with a frequency of 2, 3, 4 and 5 MHz, corresponding to a resolution of 220, 330, 440 and 550 TV lines. Slanted stripes in for control of interlaced accuracy. Contrast labels on the same lines to control stretching and repetitions. Alternating black and white squares - for evaluating the frequency response of the video path for all channels.

## 2.5 What affects the quality of video conferencing?

Unlike our usual electronic communications, such as email or messaging, video conferencing refers to the so-called real-time communications (from the English. Real Time Communications), which impose more serious requirements

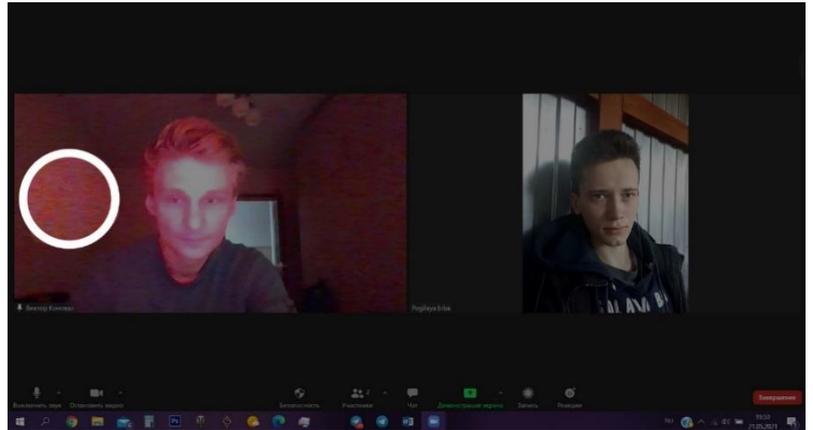
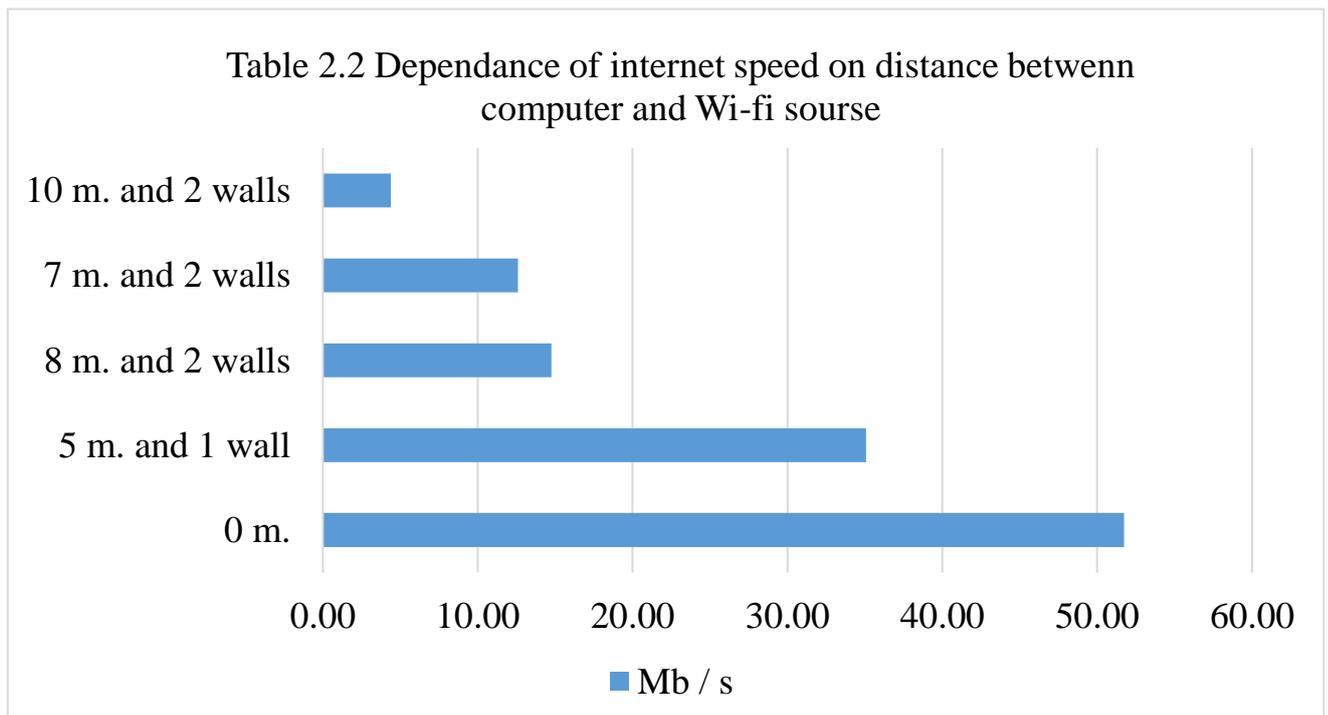


Fig.2.13 Low quality image

on both video conferencing terminals and channels the links connecting them.

We are all used to judging the quality of a connection by its speed, which in the context of a video conferencing will not be entirely true. The declared speed can change rapidly over time, it can decrease by some load, it can be radically different from the direction of transmission.

While all this is critically important for video conferencing, where the uniformity and predictability of the data flow is most important. It is not difficult



for a video conferencing system to adjust the video stream for a wide range of values from 64 Mb / s to, say, 4 Mb / s, depending on the type of conference and the signal quality of the participants. It is much more difficult to adapt the channel width in real time to the changing conditions of each of the participants in the communication session.

In real conditions, the type of architecture used for organizing video conferencing and the ability of this architecture to work in constantly changing conditions come out on top when assessing the quality of video conferencing:

- The CPU power of the end terminals. In parallel with the communication session, the user can start performing resource-intensive tasks.
- Capabilities of capturing video on the terminal camera. The camera can have excellent resolution, but give a “noisy” picture of poor quality in low light conditions.
- Possibilities of displaying a video conference on the terminal screen. For example, the user has left full screen mode and now he does not need to send high quality video.
- The channel width between the video conferencing server and between the participants. This is the most common situation. It can have many variations: someone in the organization started downloading a large amount of data from the network and drastically reduced the network resources for video conferencing. Or you, communicating via video from a smartphone, found yourself in a crowded place, and the nearest base station of your telecom operator can no longer guarantee you the same speed and quality of connection.

The simplest solution to this problem is hard backup of both hardware and network resources of the video conferencing system. But at the same time, such a solution is the most expensive. Fortunately, science and technology do not stand still, and modern video conferencing systems can guarantee excellent

communication quality in any environment through the use of modern software architectures. Let's dwell on this issue in more detail.

### **Conclusion to chapter**

There are types of network connection between participants in an online meeting, they differ into group and non-group, when there is only one participant from both sides.

There are off-the-shelf conferencing kits that take up less desk space and save time to set up and prepare for each session.

For debugging and adjusting the equipment, we can use the software on our computer as well as special equipment to check the quality of the camera image.

## CHAPTER 3

### WORKPLACE DEVELOPMENT

#### 3.1 Workplace requirements

Working in an office, one way or another, is connected with working at a computer, and 8 hours a day, or even more, which does not in the best way affect the feeling of the spine and your posture.

In addition, you also run the risk of earning vision problems. Added to this is the installation of technical support in the offices of the employer, which is not always consistent with the standards.

If you do not want to aggravate your health problems and, if possible, correct existing ones, try to adhere to the maximum number of useful tips given by experts:

If there are several computers in the same office, it is strongly recommended to place them at a distance of at least 2 meters from each other. You also can't place them opposite each other.

When choosing the location of your computer monitor, try to place it at a distance of 65 cm from your eyes. The best solution is to put the computer in the corner of the office.

The location of the keyboard should be 10 to 30 cm away from you.

If you do not want your computer to overheat, then never place the system unit and other computer components close to the wall or to any other objects.

Consider which side the light falls in your workplace. This also applies to windows and lamp lights. It should fall from the left.

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<i>Консульт.</i>	<i>Белінський В.М</i>				<b>173 «Авіоніка»</b>		
<i>Н-контр.</i>	<i>Левківський В.В</i>						
<i>Зав. каф.</i>	<i>Павлова С.В.</i>						

Don't forget about fresh air when you work. Your office should have a good ventilation system and a humidification system. If such measures are not enough, it is necessary to air the room more often.

If there is no natural light in the office where you work, you should also use a work (light on the walls and on the table) with a general (ceiling) light. The best option is if it is of the scattered type, rather than the directional one.

Before installing the printer in your office, consider a few features: laser printers tend to emit harmful radiation, inkjet printers are not harmful. It would be ideal to place the laser printer far from the work area, or even better in a separate room. It is also worth considering that both types of them do not tolerate the presence of dust, heating devices at close range, as well as direct sunlight.

Depending on which hand you have, place your organizer and phone on the same side. In case the employer has not purchased employee footrests, install one for yourself.

### **3.1.1 Devices list and they characteristics for holding a conference**

The workplace should be equipped with the following devices:

- 1 Computer, mouse, keyboard;
- 2 Monitor, which will broadcast information during the lesson;
- 3 The second monitor for the prompt and showing the general picture, which is broadcast during the lesson;
- 4 Camera filming the lesson leader;
- 5 A camera that captures information on a board, or shown by a projector;
- 6 A camera that captures the working surface of the table, on which the tutor can make notes, drawings, or clearly show something;

7 Microphone, speakers or headphones.

Recommended parameter	Value
Resolution of monitors	1920x1080 p
Monitor type	Not less than IPS
Brightness of monitors	400 K / m <sup>2</sup>
Noise level in room	15-20 dB
Illumination of the room	500 L
Table dimensions	140x60 cm
Working surface height	75 cm
Chair seat height	50 cm
Distance between eyes and monitor	65 cm

Table 3.1 Characteristics of the workplace

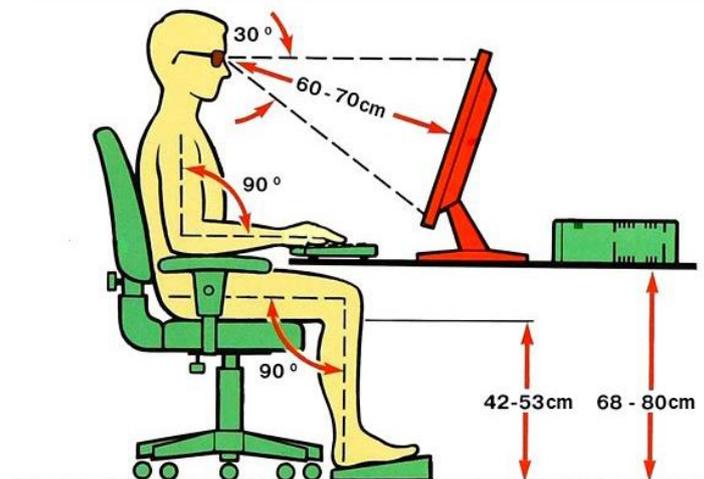


Fig.3.1 Dimensions of the workplace

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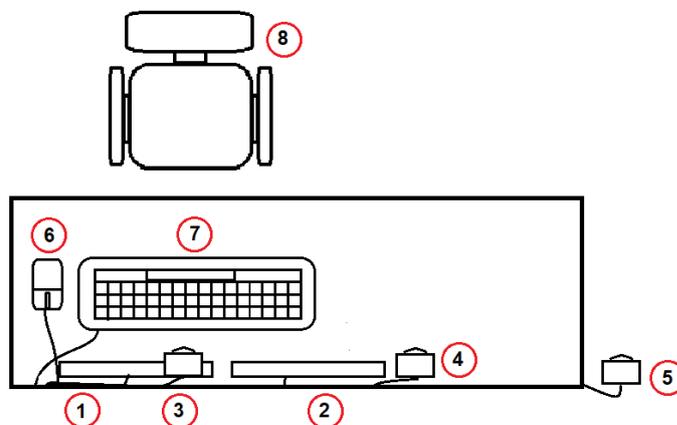


Fig.3.2 General scheme of the workplace

1,2 - Monitors, 3 - Camera, which is directed at the lesson leader, 4 - Camera, which is directed to the workplace, installed vertically, 5 - Camera, which films the board, 6 - Mouse, 7 - Keyboard, 8 - Chair, 9 - Board.

### 3.1.2 Devices list and they characteristics for lessons listeners

It is also very important, what kind of equipment is at the disposal of those who will listen and perceive information during an online lesson. This can be a lesson at home, or in another branch of the airline, or on the road, and from this we can build different requirements for which device to choose and use in the future.

1 Computer with camera and microphone, for work at home or in the office of an enterprise;

2 A laptop for mobile work, when you need to go on a business trip, or conduct a lesson on an airplane, car;

3 Mobile phone or tablet, in case of emergency video conference, outdoors, not prepared.

Recommended parameter	Value
Noise level in room	15-20 dB
Illumination of the room	500L
Working surface height	75 cm
Chair seat height	50 cm
Distance between eyes and screen	65 cm
Mobile connection speed	Not less than 20 Mb / s
Mobile screen diagonal	7 inches
Tablet screen diagonal	15 inches

Table 3.2 Ergonomic of the workplace

### **3.1.3 Workplace of trained personnel**

Staff members, unlike the lesson leader, may have at their disposal a simple computer with one camera and headphones, or a laptop to listen to the material, or listen to online classes.

Let's assume a situation.

The members of the business trip team are tired after a long flight, they need food, rest in the form of sleep, and soon an online report on the work done to their superiors.

Or another situation, an intern at an enterprise is being trained, and during lunch, he is given time to review the material and then pass it on.

In this case, in the offices of airline branches, there should be special rooms equipped specifically for rest and workplace, for viewing information, online reports or conducting online meetings. For example, it can be a room with several beds and a work table, behind which there is a working computer, or such a table with a computer can be installed in a dining room where there are sofas and tables, and one computer in this room can be used for large lectures or online conferences.

### **3.2 Health recommendations**

Whenever you work at a computer, remember that your chair can be as comfortable and pleasant as you want, but working for many hours in a sitting position is bad for your well-being and productivity.

You get tired quickly and have back pain. To prevent this from happening, one should not forget about the rest. Sometimes, when you are doing a warm-up or just walking, your thoughts are working much more actively than working hard at the computer.

For this reason, you should always remember and follow the next recommendations of doctors:

When you work a lot in a sitting position, you cannot do without rest. Take breaks for every 1.5 - 2 hours of your work. Difficulties may arise with this in the office. In this case, it is worth doing at least a little warm-up on the chair. Also change your posture often, stretch your legs and back.

Be mindful of your eyes when working at a computer. When you look at the screen, you blink much less, which results in dry and tired eyes. Try to blink more often, take gas away from the monitor, and close them for a few minutes. It will be good if you also do gymnastics for your eyes: press a little with your fingers on your eyelids, try to rotate the pupils for and counterclockwise, tap and press a little with your fingers at the temples and on the head. This will relieve eye strain, and it will be easier for you to work further.

To keep your eyesight from straining so much, use paper stands. If you need to read a lot of materials that do not need to be constantly corrected, it would be better to print them and use them in paper form. This way you will be less stressful for your eyes and easier to perceive the text.

Sedentary work is very harmful not only to the eyes, but also to your neck. It can become numb and unpleasantly ill. In order not to bring it to this, it is worth kneading it more often: making turns in different directions, as well as various shoulder lifts. It will also be useful to stretch your back - you can also do various turns of the body and back. This will make your work and stress much more comfortable.

After you have finished working, you should not start your vacation by watching TV, movies on your computer, or doing other things with your gadgets. You need to rest your eyes and body after work. The ideal solution would be a walk in the fresh air or sit with your eyes closed in silence. Physical activity is also a

good alternative. This will help relieve fatigue, fill you with energy and good mood.

### **3.3 Safety when using the computer**

When working at a computer, we do not always think about making it safe. Safety rules exist not only in the event of a fire, but also apply to technical failures, which happens quite often. In this regard, try to follow this list of simple rules when working with your computer equipment:

Electrical wiring is one of those things that can drag out your entire workflow. So that you do not have any problems with it, before starting to work at the computer, check its serviceability every day. The sockets and plugs that are used must not have any cracks or chips. Also, exclude the wires hanging from the edges of the table and finding them on the floor if there is a possibility of pressing them with something heavy.

If there are small children in the house, then special sockets should be used, where there is protection from external influences. This will minimize the possibility of unforeseen consequences.

Remember to keep the wires away from heating devices and never touch them. This is especially true in winter, when additional devices are so often used to ensure the desired temperature.

Do not forget about the possibility of network overload due to household appliances. Because of this, the wires can overheat and if there are problems with the automation, a fire can occur. Therefore, always check how many appliances are running at the same time.

Working at a computer that has obvious external damage is also unacceptable. It is better to replace it or hand it over to a service for repair.

You should not work in damp rooms in front of a computer - this is very

dangerous. It is also not allowed to work with wet hands.

In order for the PC to work normally, cool down and not fail, never put foreign things on the system unit.

Do not forget that you must not place liquid substances (this also applies to water in the cooler and drinks in glasses) near the computer.

Dust is very bad for your computer. Therefore, do not forget to remove it from all its parts in time. It is also worth remembering that the system unit must be cleaned periodically (about 1 time per year).

It is undesirable to leave the PC turned on for a long time. Also, you do not need to turn it off too often. Use sleep mode if you need to get away from it for a while.

### **Conclusion to chapter**

Requirements for the characteristics, dimensions and general arrangement of the haven have always been important aspects in any enterprise, in any activity. Also, in our case, the dimensions of the chair, the table is important, for the correct and healthy working or educational process for participants in online lessons.

And we also need a list of equipment: 2 Monitors, 2-3 cameras, mouse, keyboard, computer, headphones or microphone with speaker.

## CHAPTER 4

### EXPERIMENT

#### 4.1 Preparation for an online classes

Before teaching lessons, you need to properly prepare for classes. You should know about the educational level of listeners, their age and occupation, following from this, choose and prepare information, materials and teaching method for classes and meetings, this is written in Chapter 1, as well as have a connection in some kind of application with all these people and their phone numbers, for convenient communication outside the classroom. Draw up and agree on a schedule for future online lessons. Because not every member of the class can be free at a particular time of the day.

Next, equip your workplace, check and configure your computer and other gadgets, as shown in Chapter 3.

#### 4.2 Instructions for launching and using the application for an online lesson

1 Open Google Chrome or your other browser and go to the Google Classroom page.

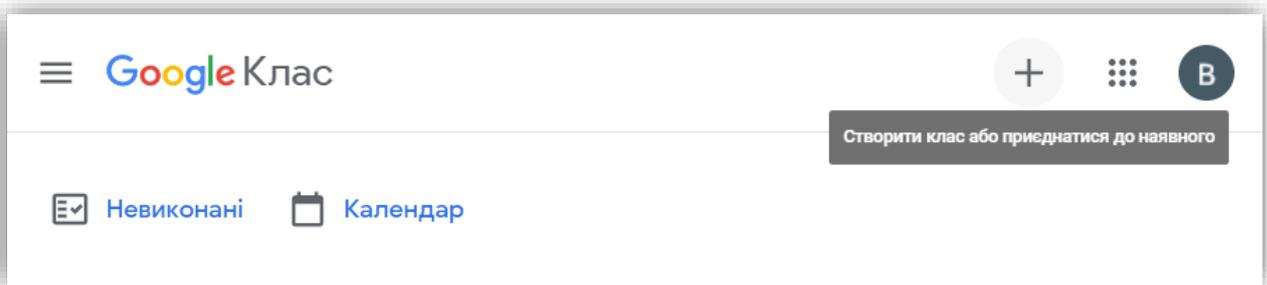


Fig.4.1 Screenshot of Google Class

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<i>Керівник</i>	<i>Белінський В.М</i>					52	79
<i>Консульт.</i>	<i>Белінський В.М</i>				173 «Авіоніка»		
<i>Н-контр.</i>	<i>Левкієвський В.В</i>						
<i>Зав. каф.</i>	<i>Павлова С.В.</i>						

2 You are on the main page environment page Google Classroom on the main page medium click top right button "+", Select "Create a class"

Fig.4.2 Screenshot of adding new class

3 In the creation window virtual course / class enter its name and attributes (on own desire) and press the button "CREATE".

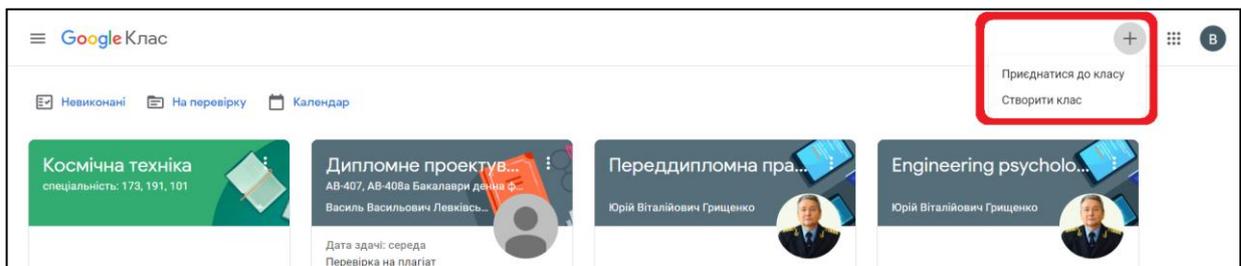


Fig.4.3 Screenshot of class creation

Створити клас

Назва класу (обов'язково)  
Космічна механіка

Розділ  
спеціальність: 173, 191, 101

Тема

Аудиторія

Скасувати Створити

Your course / class created!

4 Add to the course listeners through the menu People → Invite employees by sending your code course / class.

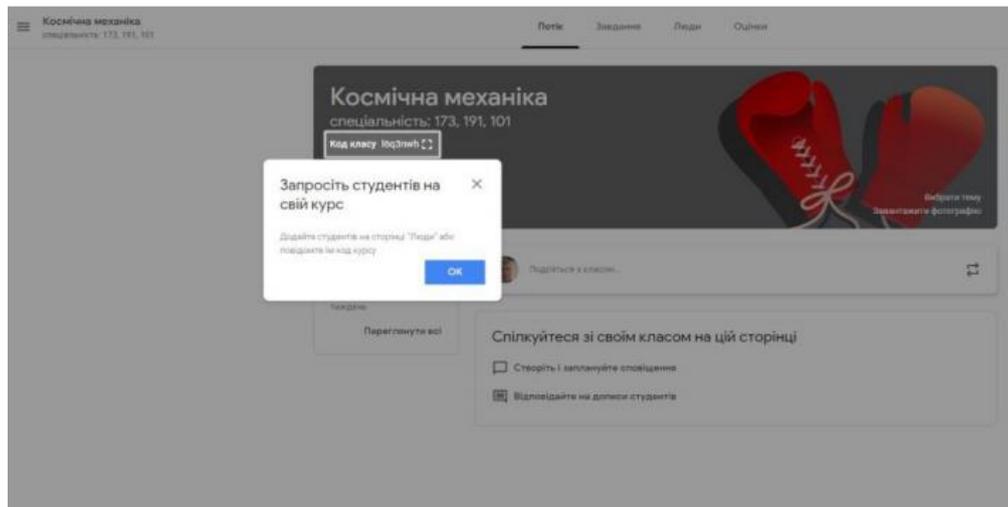


Fig.4.4 Screenshot of listeners invitation

The group is dialed, wait confirmation and joining the course. In the absence address information electronic mailboxes listeners, you can send them an invitation code for the course others available ways.

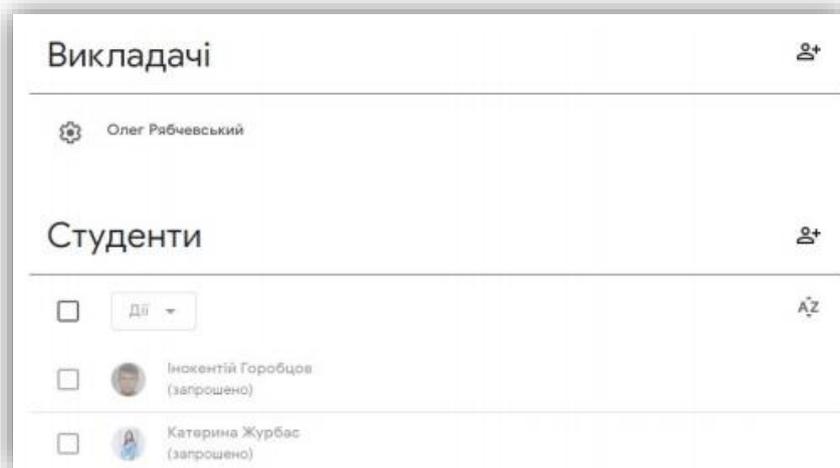


Fig.4.5 Screenshot of class listeners list

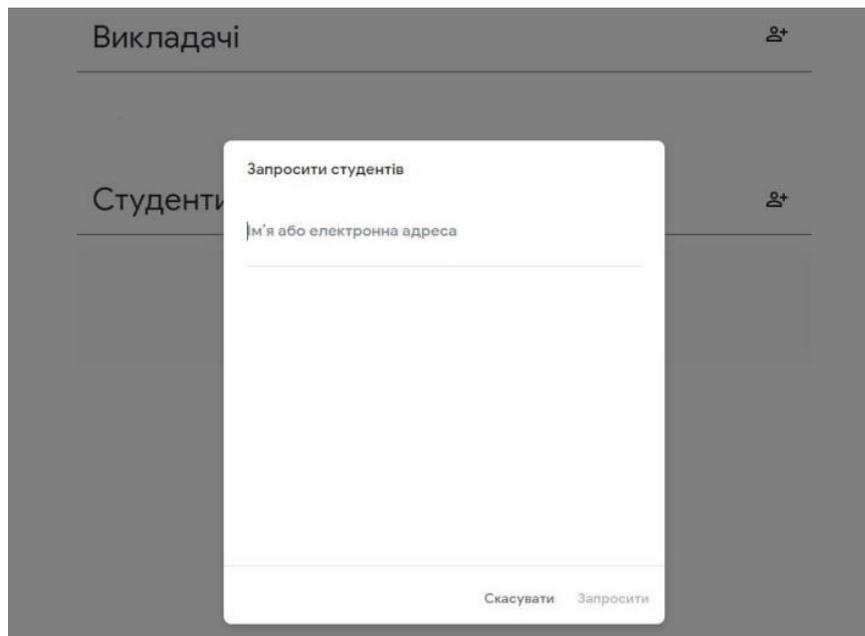


Fig.4.6 Screenshot of sending the invitations

Click on the right at the top of the button with the gear on the page, which will open, in common settings near names "Class code" click on the right on the hidden field list, select one required commands.

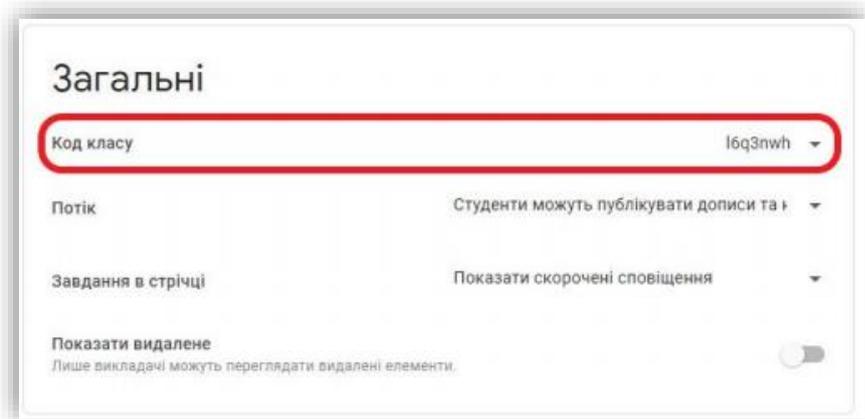


Fig.4.7 Screenshot of Google Classroom code

5 After recruiting listeners to the group, send them an online task in the Tasks → + Create tab. Then enter the name of the topic of the task and, if necessary, add a file.

6 Having created the task and setting deadlines his surrender, go before admission and task evaluation. Click on the name tasks in the stream.

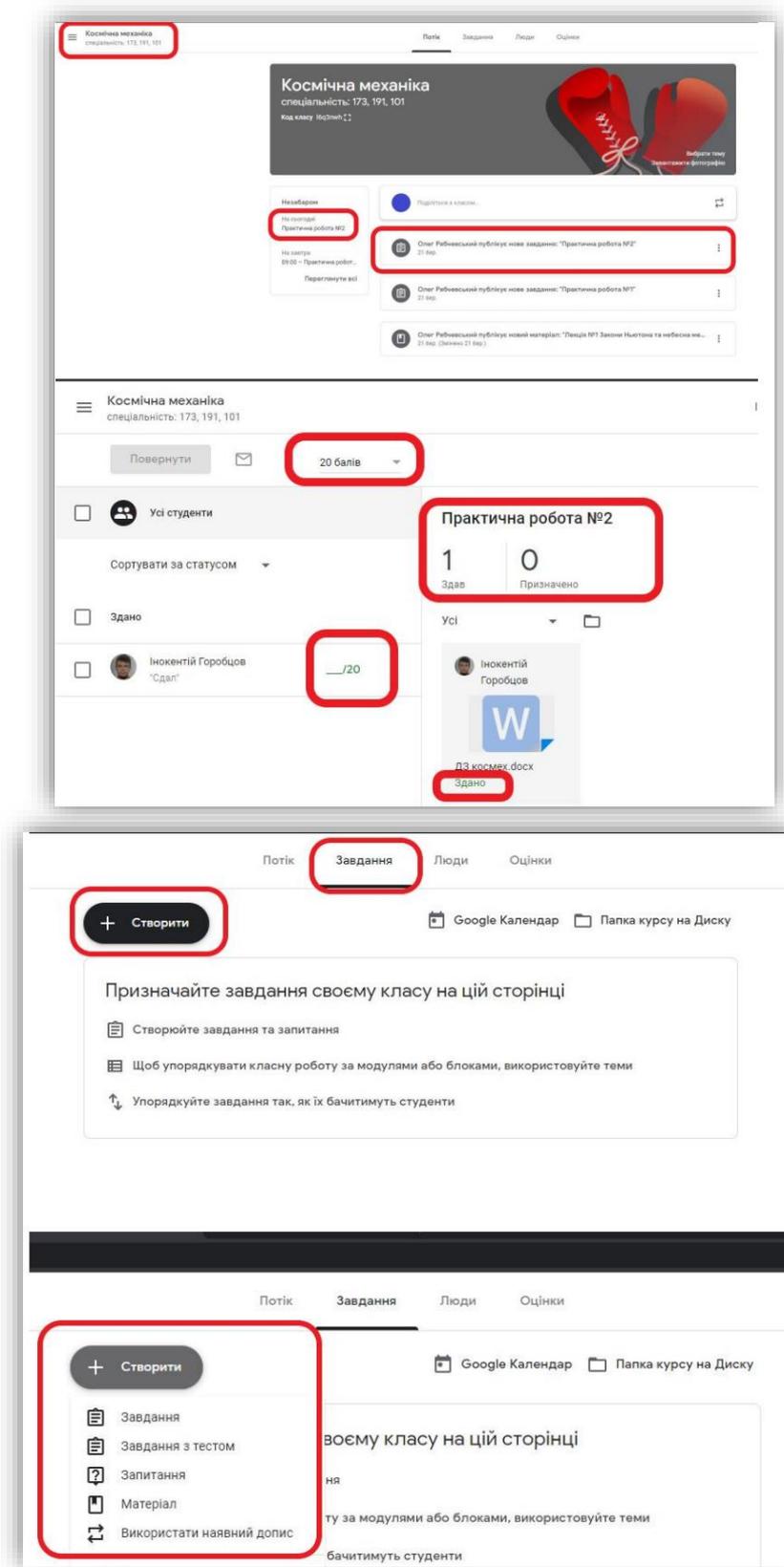


Fig.4.8-4.11 Screenshot of creating a task

In the task window you can see on the left - list of listeners and them points for completed tasks above - the maximum number points for the task you you determine independently from the keyboard (or setting “without assessments ”); right - status of work: quantity submitted works attached files with works, participant comment to work.

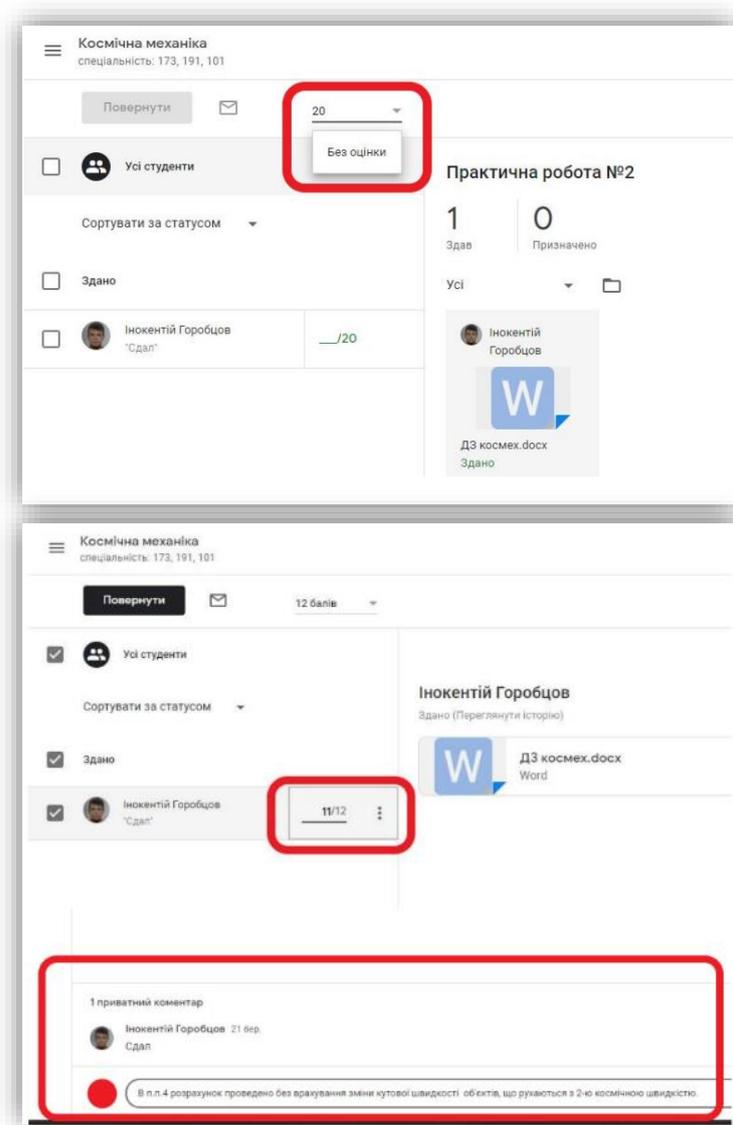


Fig.4.12-4.14 Screenshot of adding a file to the task

After checking the work, set the number points on which she appreciated. Add comment for necessity. Click "Return", that the listener received in the notification mail about the number of points for completed tasks.

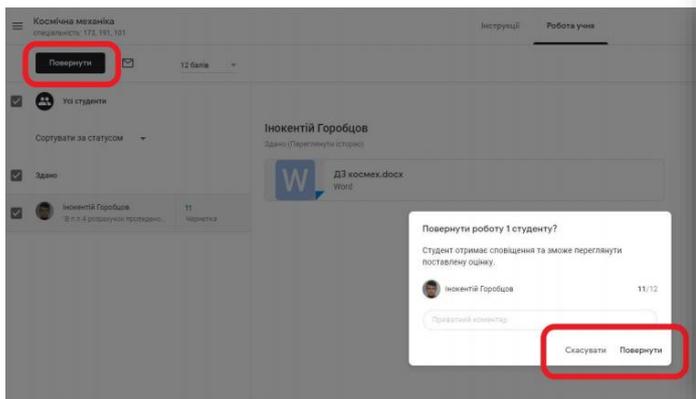


Fig.4.15 Screenshot of turning task to the listener

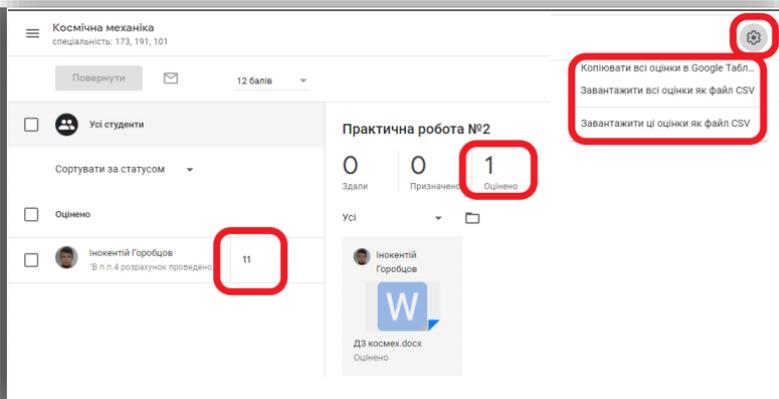


Fig.4.16 Screenshot of rating the tasks

Job status changed on "Rated". To the listener credited points. By using a gear at the top right you will be able to copy everything flow estimates in the Google table to your further work with it.

To conduct current control take advantage task with the test. Test task formed in the ordinary Google form. Check and performance appraisal the test is performed similarly.

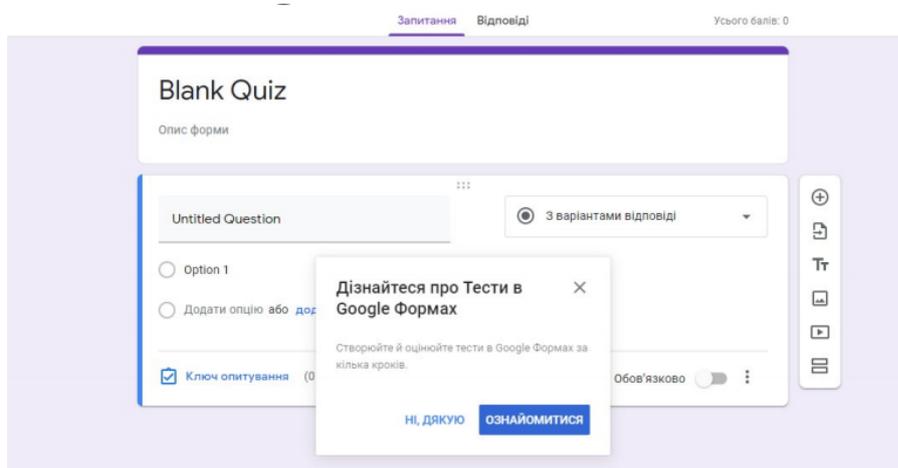


Fig.4.17 Screenshot of creating the test

Checking the task performed by the same way.

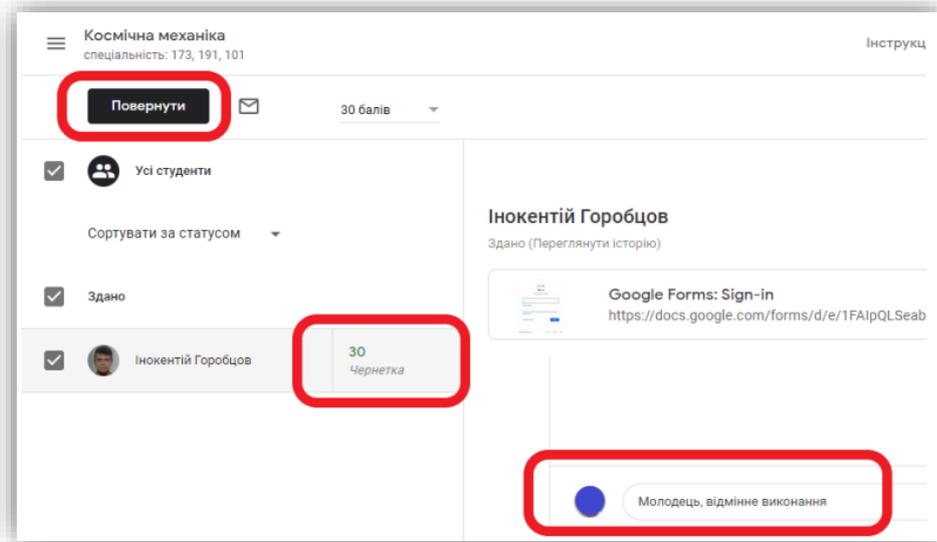


Fig.4.18 Screenshot of commenting with personnel

### 4.3 Preparation of the workplace

After reading the instructions for working with the application for conducting an online meeting, we proceed to turning on the equipment and conducting an online lesson.

For correct functioning, follow the instructions:



Fig.4.19 Photo of connections of PC equipment: monitor, two cameras, keyboard, mouse, speakers, microphone

- 1 Install the required equipment as shown in the picture;
- 2 Turn on the power;
- 3 Check all equipment before switching on for breakages, cracks, frayed wires;
- 4 Turn on the computer;

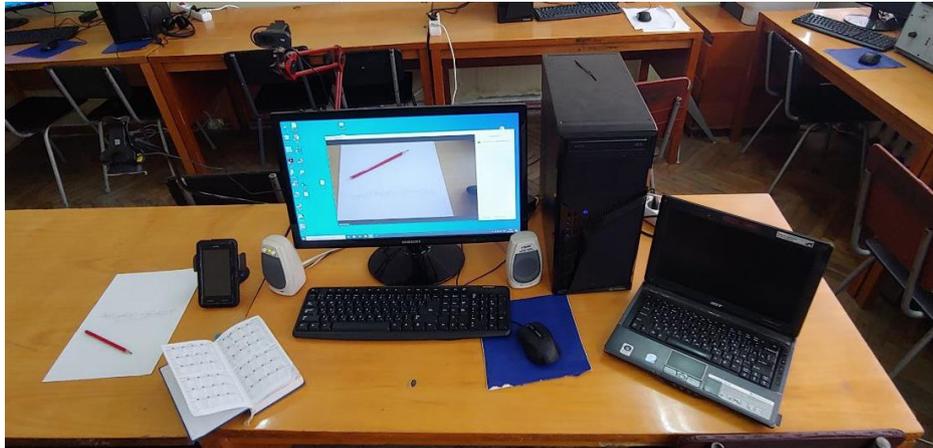


Fig.4.20 Photo of the front view on the workplace: smartphone, laptop, speakers, two cameras, PC, monitor

- 5 Open the browser;
- 6 Log in to your Google Classroom account;
- 7 Click on the link invitation to the video conference;

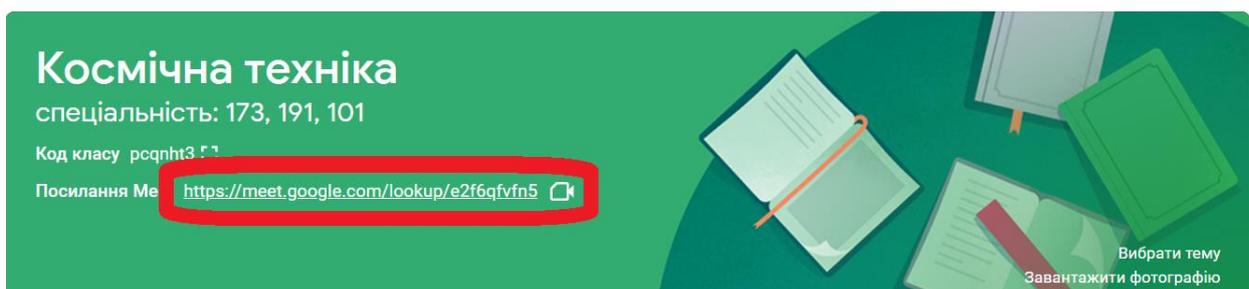


Fig.4.21 Screenshot of the link

- 8 Test the microphone and camera work in the Classroom without listeners;

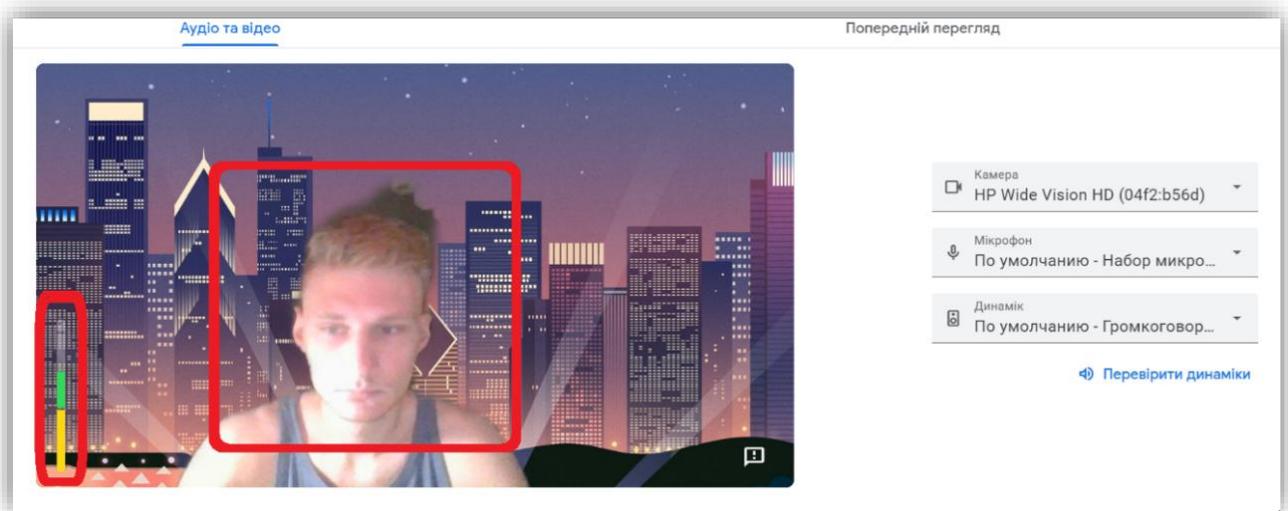


Fig. 4.22 Screenshot of voice and video checking window

9 Enter the video call;

10 Start an online lesson;

11 After the online lesson, turn off Google, close all enabled applications on the computer;

12 Turn off the computer;

13 Turn off the power.



Fig. 4.23 Rear view of two cameras with a lever tripod and a flexible tripod and a monitor

In creating a real prototype of the workplace, I managed to assemble the following equipment: a computer with a mouse, keyboard and a monitor that will show theoretical information during the lesson, a laptop that will act as a prompter, providing detailed information for conducting a lesson for the leader of the lesson, a telephone that will show a general picture that is broadcast from this workplace. Also, there are two cameras on tripods, one camera is directed downward and can be switched to show some kind of diagrams, visual displays, the second on a swivel tripod can be aimed at the coach, or at the board, which is located at the back.

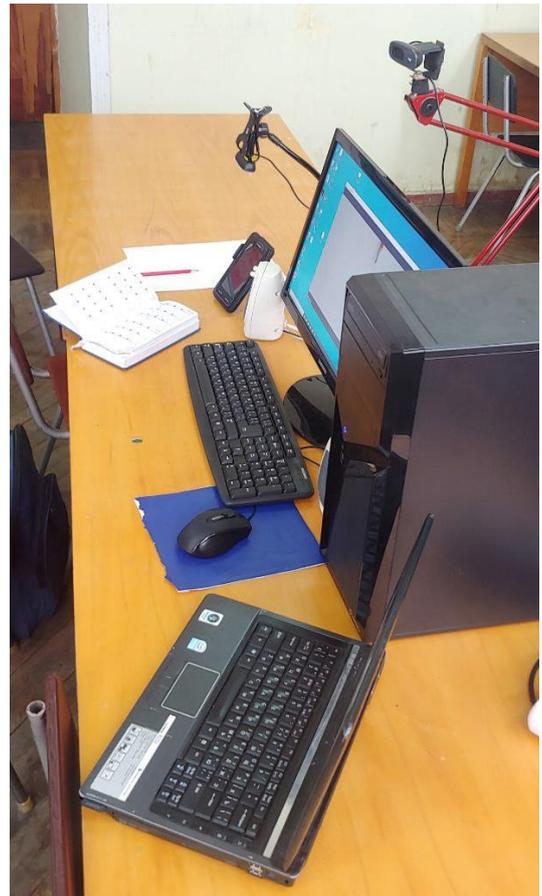


Fig. 4.24 Front view on the monitor

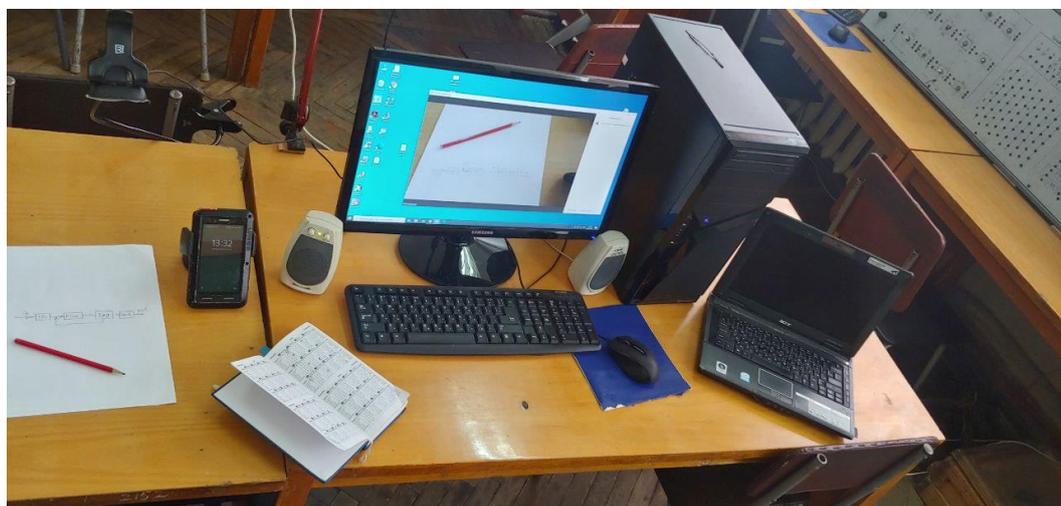


Fig. 4.25 Side view of two cameras, and a monitor in regime of vertical camera translation

## **Conclusion to chapter**

Conducting online lessons requires a lecturer to be able to teach, choose an approach to present information and a teaching method. Modern conditions also require the ability to handle complex equipment and software. Detailed step-by-step switching on, using the setting and working in the remote mode of training the airline personnel.

## CHAPTER 5

### CONDUCTING AN ONLINE LESSON WITH AIRLINE PERSONNEL

#### 5.1 Lesson introduction

1. The goals and objectives of the lesson should be announced at the beginning of the video call, and at the end, summarize - whether all the goals of the lesson have been achieved and briefly summarize the results.
2. New material is best explained using familiar vocabulary. Thus, the listener will not only be able to fully concentrate on new information, without being distracted by the search for the meaning of new concepts and terms, but also to repeat those already studied, applying them in a new lesson.
3. The studied material must be used in one way or another in subsequent lessons.
4. Any material that is given during the lesson will be better assimilated if shown in a thematic video. Thus, the practical benefits of the acquired knowledge become obvious.
5. In an online lesson with aviation personnel, priority is given to theory and the ability to apply it in practice. Modeling various technical tasks are one of the most effective ways to consolidate theoretical knowledge. From this point of view, group or pair work gives good results. Pair and group work should be given sufficient time in each lesson.
6. In each lesson there should be a concept such as the logic of the lesson. The lesson should become a logical link in the learning chain - a continuation of the previous one and preparation for the next.

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<i>Керівник</i>	<i>Белінський В.М</i>					<i>64</i>	<i>79</i>
<i>Консульт.</i>	<i>Белінський В.М</i>				<b>173 «Авіоніка»</b>		
<i>Н-контр.</i>	<i>Левківський В.В</i>						
<i>Зав. каф.</i>	<i>Павлова С.В.</i>						

### **5.1.1 Plan of the lesson**

#### 1. The purpose of the lesson

Listeners should familiarize themselves with the technical description of the EASy Modular Avionics and study its technical characteristics.

#### 2. The tasks

Study and make reports on the following issues:

- General of the EASy MA;
- Description of the EASy MA;
- Controls and indications of the EASy MA.

### **5.2 An example of an online lesson**

#### The Enhanced Avionics System Modular

##### 1. General of the EASy MA

The Enhanced Avionics System (EASy) is based on Honeywell Primus Epic system architecture composed of new EASy cockpit controls, displays and modular avionics.

The present chapter is dedicated to the modular avionics which is composed of:

- 2 Modular Avionics Units (MAU),
- 2 Modular Radio Cabinets (MRC),
- Data communication buses.

At this lesson we will consider only MAU system.

#### AVIONICS FUNCTIONS

The EASy modular avionics provides the following avionics functions:

- Processing of display for:

- Attitude information based on IRS data,
  - Radio Altitude information based on Radar Altimeters data,
  - Air Data information based on Air Data Systems data.
- Elaboration of data and processing of display for:
- Navigation (GPS, VOR, DME, FMS, ILS...),
  - Flight Director / Thrust Director Guidance,
  - EGPWS.
- Transmission of FD orders to Primary Flight Control System for AutoPilot function,
- Elaboration of Auto-Throttle commands for Throttle Quadrant,
- Communication means,
- Transmission of TCAS guidance received from the independent TCAS.

### MULTI-SYSTEM FUNCTIONS

In addition to avionics functions, the EASy modular avionics provides the following functions, based on data received from airplane systems:

- Display of CAS/Fault messages related to system failures,
- Display of systems synoptic,
- Transmission of data between systems,
- Recording of maintenance data.

### OPTIONAL EQUIPMENTS

Optional equipments include:

- Within the MAU2: second EGPWS module,
- Video capability.

## FLIGHT DECK OVERVIEW

### CONTROLS

Controls available for the modular avionics are:

- The Master switches to power the different modular avionics components.

Master switches are described in ATA 24.

- Two Data Acquisition Unit (DAU) reversion rotary switches on the Reversion Panel (RP)

### INDICATIONS

There is no dedicated synoptic for the modular avionics.

Failure messages associated with modular avionics will be displayed in the CAS window or in the STATus synoptic FAULT tab page.

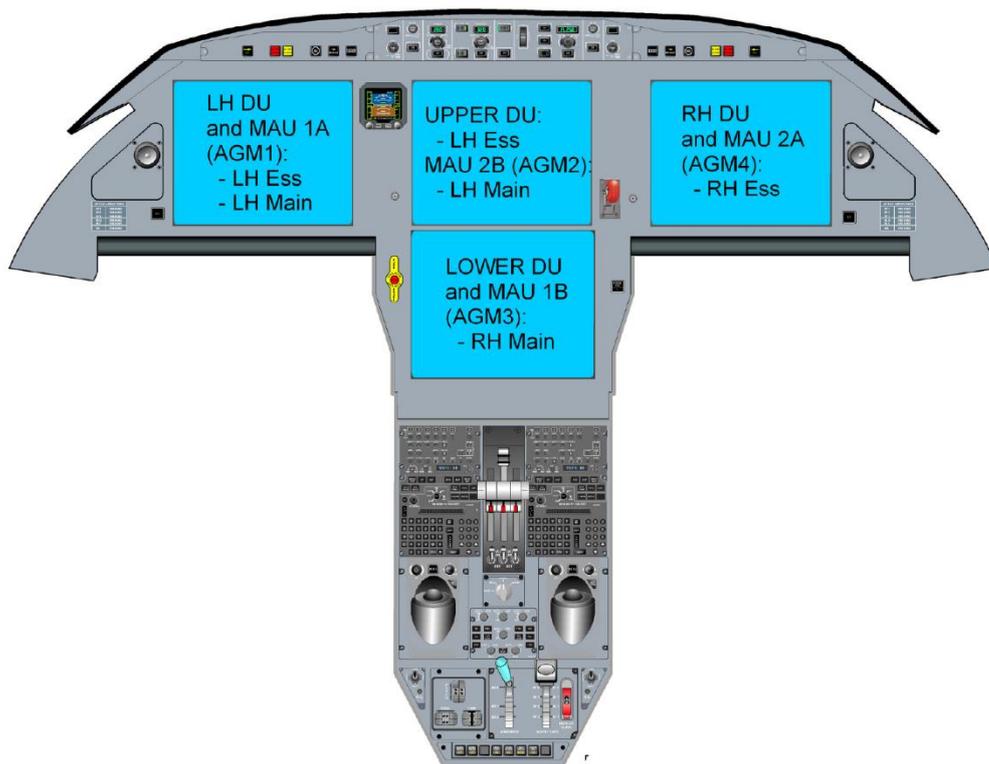


Fig. 5.1 Modular avionics controls and indications

## DESCRIPTION

The EASy basic architecture is referred to as a “distributed architecture”, which means that the various functions are distributed among a variety of modules and processors in the system.

Many of the processors handle more than one function. The different modules and processors of the modular avionics are installed within modular cabinets:

- Two MAU (Modular Avionics Unit) cabinets, MAU1 and MAU2 dedicated to:
  - Avionics functions (except for some communication and navigation functions),
  - Multi-system functions.
- Two MRC (Modular Radio Cabinet) cabinets, MRC1 and MRC2 dedicated to:
  - Communication,
  - Elaboration of most data for navigation.

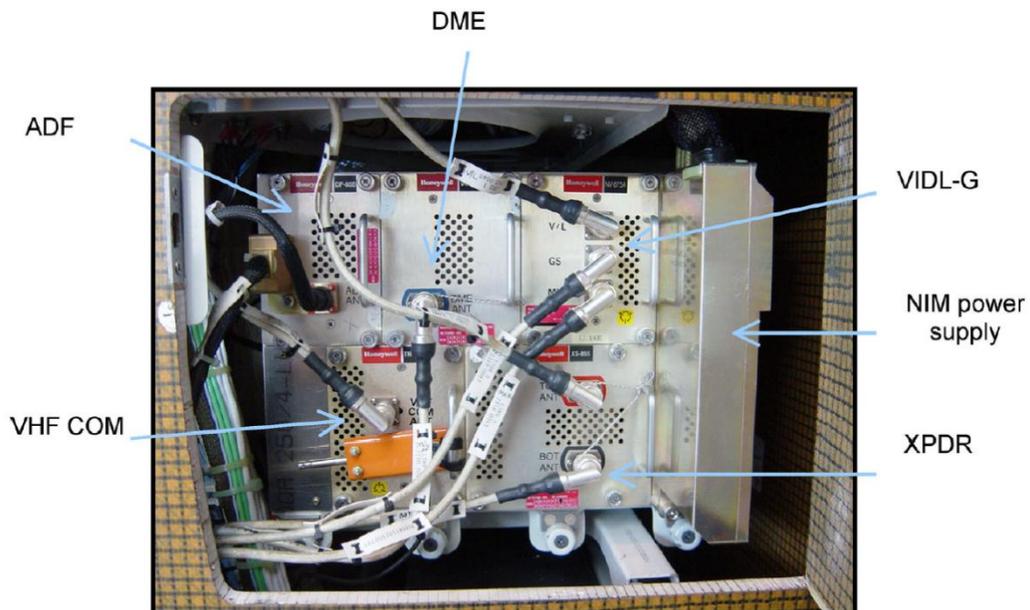


Fig. 5.2 View of MRC

## **Two MAU**

- Avionics functions (except some communication and navigation functions):
  - Display of altitude, attitude, speed,
  - EGPWS,
  - Flight Directors Orders,
  - Thrust Director, Auto Throttle Orders,
  - Display of navigation / communication data from MRC,
  - TCAS alerts and guidance..
- Multi system functions:
  - Crew Alerting System,
  - Systems Synoptics,
  - Data exchanges,
  - Electronic CheckList
  - Maintenance data

## **MODULAR AVIONICS UNIT**

With regard to the two Modular Avionics Unit (MAU):

- The MAU are dual channel: MAU 1A / MAU 1B, MAU 2A / MAU 2B,
- The four channels are active at the same time, as they do not perform the same functions.
- Each channel includes the following main modules:
  - Processors for data processing,
  - AGM (Advanced Graphical Modules) for display management and EASy data
  - exchange through MKB and CCD,
  - Generic I/O (Inputs / Outputs) modules for data exchanges with other systems,
  - Control I/O (Inputs / Outputs) modules mainly dedicated to data exchanges with EASy controls and audio warnings,

- A power supply module,
  - Interface controllers for management of communication MAU modules with buses (NIC: Network Interface Controller).
- The MAU modules are field-replaceable and represent “building blocks” of the Primus EPIC system.
- Each MAU integrates three cooling fans.
- Refer to ATA 31\_2 "Indicating and Recording - Displays" for a description of AGM.

### NOTES

The functions performed by the MAU are residing on one or more processor modules. Therefore the loss of one module might induce the loss of some avionics or systems functions.

The loss of the power supply module of one channel will induce the loss of all modules of this MAU channel, including the Generic I/O and Advance Graphical Modules (AGM). Therefore:

1. The display related to the AGM will be red crossed.
2. Some avionics or systems functions might be lost.

### DATA EXCHANGES BETWEEN SYSTEMS

Data exchanges between the different aircraft systems and the MAU is performed through the Generic I/O modules.

Each MAU channel is fitted with two Generic I/O modules, except MAU 2A which contains three modules.

grouping of the two Generic I/O modules of each MAU channel is called a Data Acquisition Unit (DAU) channel.

Each MAU contains therefore two DAU channels:

- MAU 1 contains:
- DAU 1A in MAU 1A

- DAU 1B in MAU 1B
- MAU 2 contains:
  - DAU 2A in MAU 2A
  - DAU 2B in MAU 2B

Each DAU is dual channel, channel A being normally in control.

In case of a DAU channel A failure there is an automatic reversion to channel B. The crew members can also select manual DAU reversions, in order to use DAU channel B instead of channel A.

### **DESIGN PRINCIPLES**

The modular avionics allows the airplane to benefit from full power of multi-tasking digital computer processing.

With regard to electrical power supply:

- For each MAU, one channel is powered by one Essential bus and the other channel by the Main bus on the other side,
- One NIM module (MRC 1) is powered by Essential bus and the other (MRC 2) is powered by Main bus,
- Each module of the MRC has a separate power supply (refer to ATA 23\_1 and 34\_10).

### **EQUIPMENT LOCATION**

#### MAU LOCATION

MAU 1 and MRC 1 are located under floor. MAU 2 and MRC 2 are located in the nose cone.

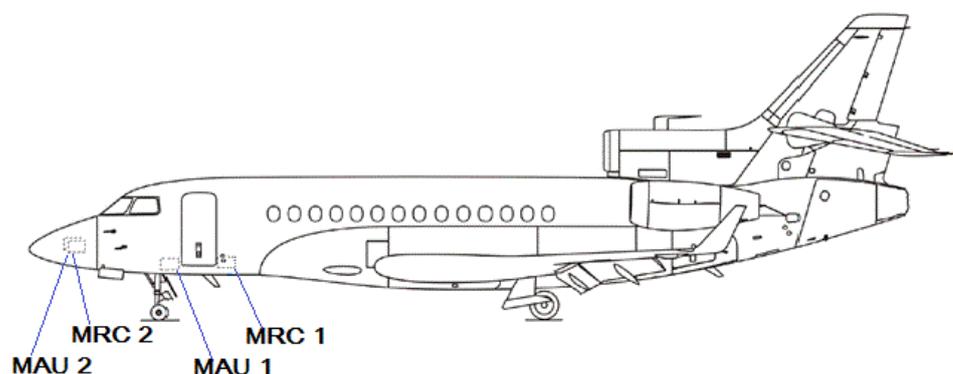


Fig. 5.3 MAU 1, MAU 2, MRC 1 and MRC 2 locations

## 2. ELECTRICAL POWER SOURCE

The following paragraph describes the power supply of the different equipment of the EASy modular avionics system.

Electrical protection is provided:

- Either by Solid State Power Controllers (SSPC),
- Or by Circuit Breakers (CB).

Refer to ATA 24 – ELECTRICAL POWER for additional information.

EQUIPMENT	POWER SUPPLY	MASTER SWITCH	TYPE OF PROTECTION
MAU 1A	LH Essential (and LH Main when Essential is lost)	LH INIT	CB
MAU 1B	RH Main	RH MASTER	CB
MAU 2A	RH Essential	RH IN IT	CB
MAU 2B	LH Main	LH MASTER	CB
MRC 1 NIM	LH Essential	Not relevant	CB
MRC 2 NIM	RH Main	RH MASTER	CB

Table 5.1 Structure of EAS

## 3. MODULAR AVIONICS UNIT OVERVIEW

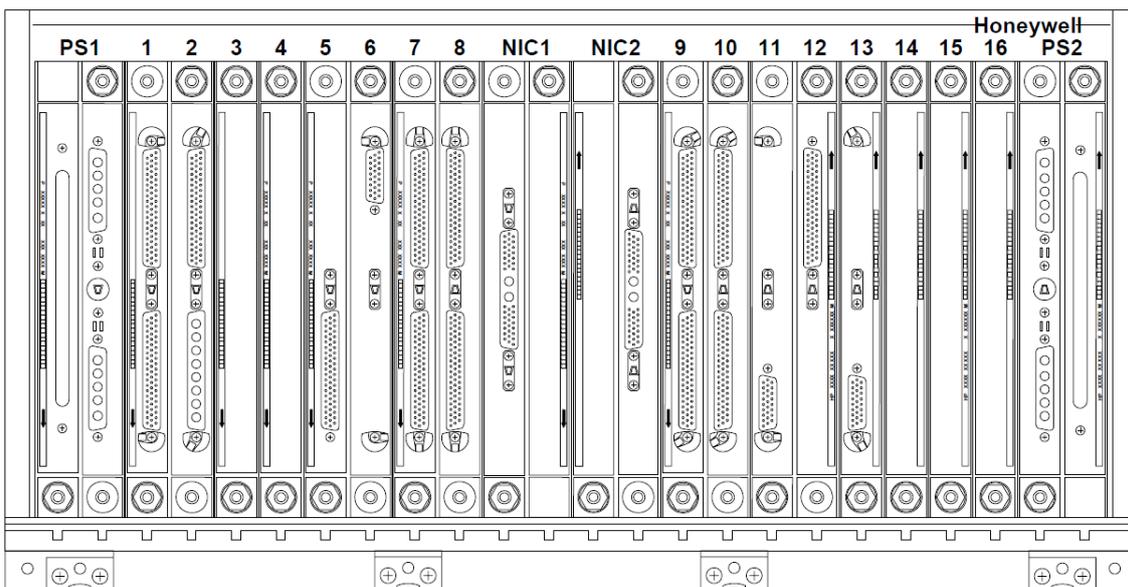


Fig. 5.4 Front view of MAU

The following figures provide the layout of modules within the two MAU. The MAU modules are field-replaceable.

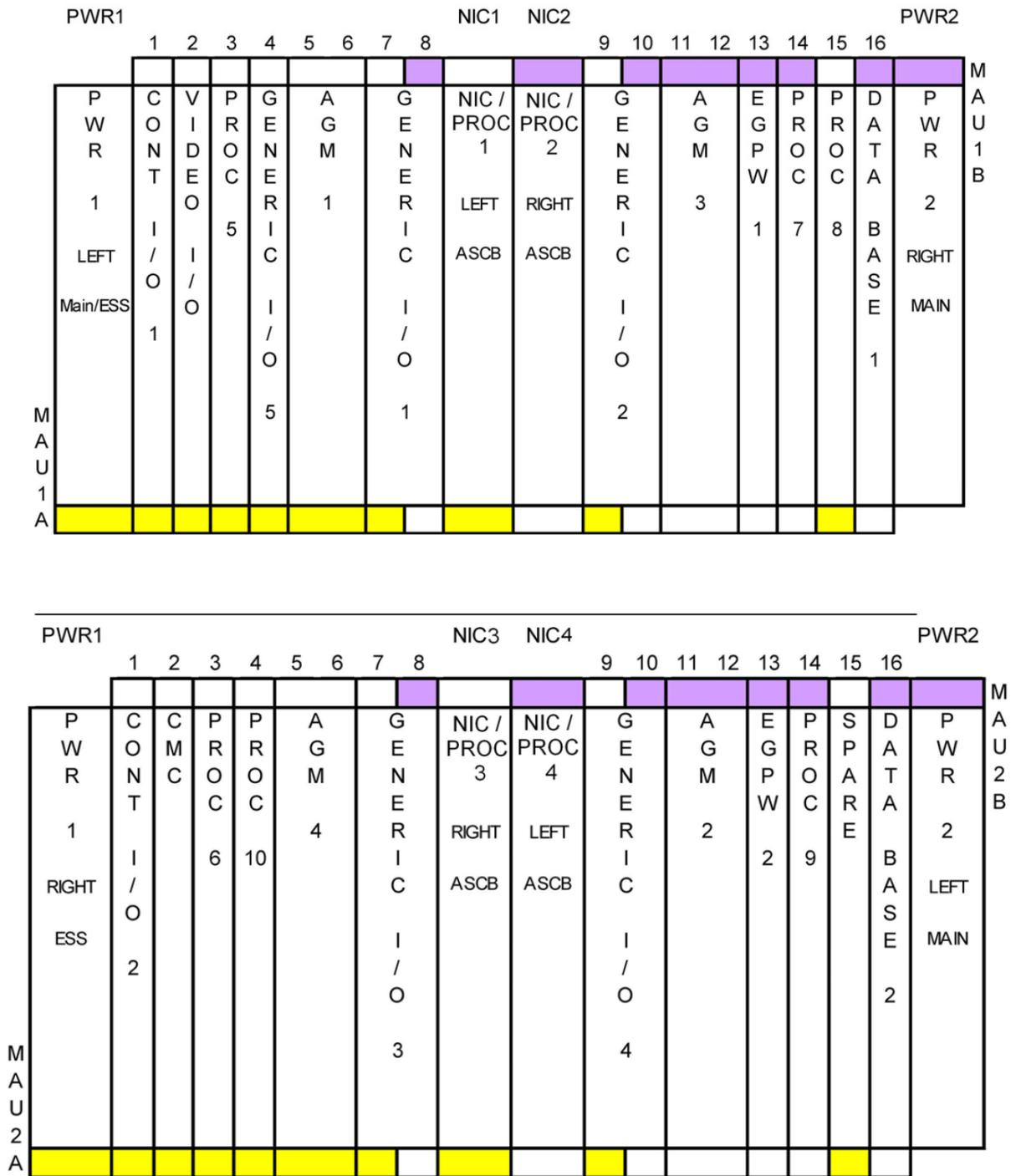


Fig. 5.5 MAU 1 & 2 LAYOUT

The functions and systems are residing on one or more processor modules. The following figure provides the layout of functions within the different processor modules.

<b>MAU 1A</b>	<b>MAU 1B</b>	<b>MAU 2A</b>	<b>MAU 2B</b>
(AGM 1)	(AGM 3)	(AGM 4)	(AGM 2)
Audio Warning A (CONTROL I/O 1)		Audio Warning B (CONTROL I/O 2)	
AutoThrottle 1A (PROC 8)			AutoThrottle 1B (PROC 9)
		(CMC)	
CMF 1 (optional) (PROC 1)		CMF 2 (optional) (PROC 3)	
(CONTROL I/O 1)		(CONTROL I/O 2)	
	(DATABASE 1)		(DATA BASE 2)
ECB 1 (PROC)			ECB 2 (PROC)
ECL (PROC 1)		ECL (PROC 10)	
	(EGPWM)		(EGPWM) (optional)
Flight Director 1A (PROC 8)	Flight Director 2B (PROC 7)	Flight Director 2A (PROC 10)	Flight Director 1B (PROC 9)
Flight Director 1A (PROC 8)	Flight Director 2B (PROC 7)	Flight Director 2A (PROC 10)	Flight Director 1B (PROC 9)
	FLT 1 (PROC)		FLT 2 (PROC)
FMS 1 / TOLD 1* (PROC 5)	FMS3 / TOLD 3* (PROC 2)	FMS2 / TOLD 2* (PROC 6)	
DAU 1A	DAU 1B	DAU 2A	DAU 2A
(GENERIC I/O 1A, 2A and 5)	(GENERIC I/O 1B and 2B)	(GENERIC I/O 3A and 4A)	GENERIC I/O 3B and 4B)
Monitor Warning 1 (PROC 1)		Monitor Warning 2 (PROC 3)	Monitor Warning 3 (PROC 4)
Video (optional) (VIDEO I/O)			

\*: not available at the present time.

Table 5.2 MAU structure diagram

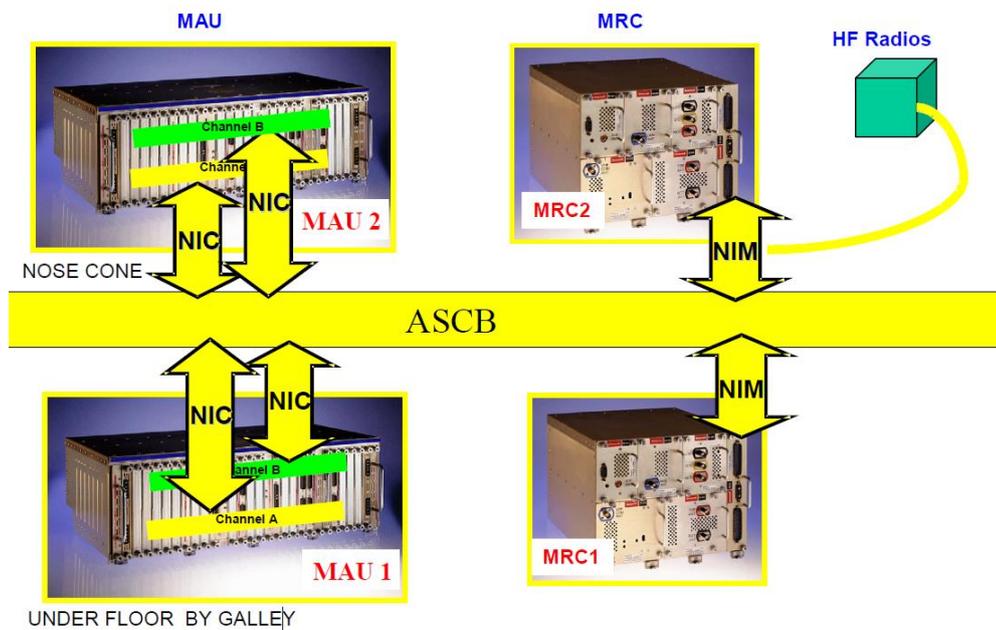


Fig.5.6 Communication between MAU and MRC

Interface between the MAU and other equipment of EASy avionics are performed via:

- Control I/O modules.

Communication between the MAU and other systems is performed via:

- Generic I/O modules for interface of MAU modules with General Purpose buses,
- General purpose buses (ARINC 429).

### AVIONICS STANDARD COMMUNICATION BUS (ASCB)

The ASCB bus is a high speed redundant and bi-directional community bus network designed to transfer a large amount of digital data between avionics systems.

The EASy network interface extends the backplane buses beyond the MAU using the ASCB. The network interface also supports a Local Area Network (LAN).

There are a variety of system network buses that support the entire network structure and enable the system to tie together standard avionics equipment with the system components.

PRINCIPLE DIAGRAMS

The first diagram shows a simplified representation of communication between an MAU channel, an MRC, airplane systems, displays, along with naming of the buses.

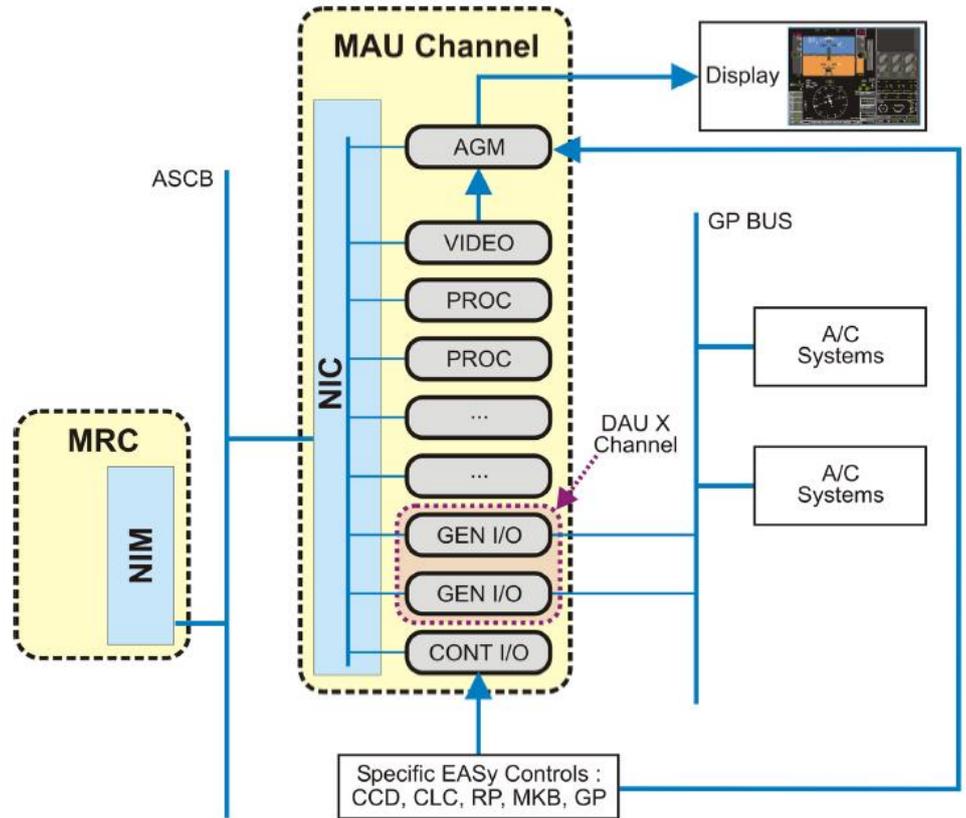


Fig. 5.7 Communication buses between mrc, mau and systems

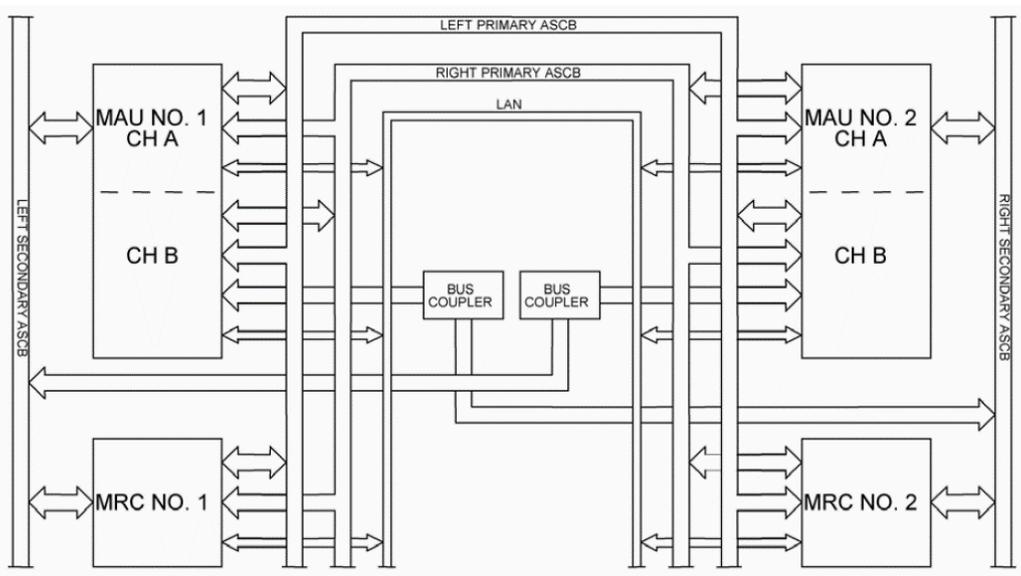


Fig.5.8 Avionics standard communications bus between MAU and MRC

## **Conclusion to chapter**

In this chapter, I gave an example of conducting an online lesson with airline personnel on the topic of the Enhanced Modular Avionics System. This system is the next link in the development of onboard equipment. It includes multifunctional devices, flight characteristics sensors and information transmitters, which are installed in a special modular cell, which, if necessary, can be dismantled for repair, maintenance, or installation of an upgraded version. The material was taught in the form of theory, diagrams, drawings and explanations to them.

## CONCLUSIONS

The explanatory notes include an explanation about modern techniques, devices and programs used in our time during distance learning.

Their advantages and disadvantages were listed, the structure, scheme and functional features of the workplace for video conferencing were developed and described.

The described workplace has a number of advantages, namely:

- Allows you to conduct classes online with the transmission of audio and video signals and the ability to broadcast training materials using three cameras;
- It has a high functionality compared to a regular laptop and allows you to clearly demonstrate a separate depiction of the actions performed by the handler.
- The experiment showed that it is convenient and effective to conduct online classes at the designed workplace.

Thanks to these advantages, the efficiency of the educational process and significantly expands the functionality of learning.

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