CONFERENCE AND THEME

"Integrated Computer Technologies in Mechanical Engineering" – Synergetic Engineering

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THEME: RESEARCH OF HUMAN-MACHINE INTERACTION ON THE EXAMPLE OF THE "OPERATOR-UAV" SYSTEM

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INTRODUCTION

WITH THE EMERGENCE OF UNMANNED SYSTEMS, THE DEVELOPMENT OF ERGONOMICS ENTERED A NEW STAGE IN STUDYING HUMAN-MACHINE INTERACTION AND EXACERBATED SAFETY PROBLEMS

THE REQUIREMENTS FOR SAFETY, FAULT TOLERANCE AND RELIABILITY OF HUMAN-MACHINE SYSTEMS HAVE CHANGED

IT CREATED THE PREREQUISITES FOR THE EMERGENCE OF A NEW TYPE OF HUMAN PROBLEM IN UNMANNED SYSTEMS

RELEVANCE AND AIM

A PERSON'S INDIVIDUALITY SHOWS ITSELF IN **STRESS TOLERANCE**, WHICH REFLECTS INTERRELATED CHARACTERISTICS THAT SIGNIFICANTLY COMPLICATE THE STRESS TOLERANCE ESTIMATION

STRESS TOLERANCE PROVIDES THE OPERATOR WITH RELIABLE AND SAFE FUNCTIONING UNDER DIFFICULT CONDITIONS

VIABILITY OF A HUMAN-MACHINE SYSTEM DEPENDS ON THE OPERATOR'S STRESS TOLERANCE AND ABILITY TO FORM IT DURING LEARNING AND ACTIVITY

ANOTHER COMPONENT THAT ENSURES VIABILITY IS THE **OPERATOR'S RESOURCES**

THEIR IMPORTANCE STANDS THAT **A VIABLE SYSTEM** MUST INCLUDE **THE VIABLE SUBSYSTEMS**

THE AIM IS TO STUDY HUMAN-MACHINE INTERACTION VIA THE ANALYSIS OF THE "OPERATOR-UAV" SYSTEM VIABILITY

THUS, STUDYING AND ANALYSING THE OPERATOR'S RESOURCES IS A COMPONENT OF RESEARCH ON THE SYSTEM VIABILITY

SEARCHING FOR WAYS TO **REDUCE THE MANIFESTATIONS OF THE HUMAN FACTOR** IN UNMANNED SYSTEMS' FUNCTIONING AND **INCREASE FAULT TOLERANCE AND SAFETY** VIA ANALYSING THE VIABILITY

TESTEES

TESTEES

THE FIRST GROUP

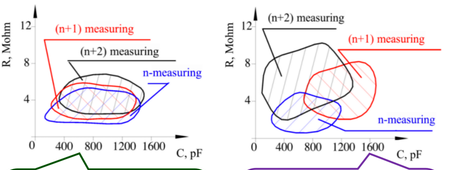
IS GRADUATING STUDENTS OF UNIVERSITIES, THE TOTAL NUMBER OF WHICH WAS 23 PEOPLE. THE AVERAGE AGE IS 21-22 YEARS

THE SECOND GROUP

IS PERSONS WITH HIGHER EDUCATION AND PROFESSION. THE TOTAL NUMBER WAS 32 PEOPLE. THE AVERAGE AGE IS 30-32 YEARS

RESULT #1

FUNCTIONAL AREAS IN THE COMPLEX PLANE BASED ON MEASURING THE BAPS PARAMETERS IN THE TESTEES



IF THE SQUARE OF THE FUNCTIONAL AREA HAS NOT CHANGED OR DECREASED, AND ITS SHIFT IS MINIMAL RELATIVE TO THE INITIAL LOCATION, IT INDICATES A HIGH LEVEL OF THE OPERATOR'S STRESS TOLERANCE

IF THE SQUARE OF THE FUNCTIONAL AREA HAS INCREASED, AND ITS SHIFT RELATIVE TO THE INITIAL PLACEMENT IS SIGNIFICANT, IT INDICATES A LOW LEVEL OF THE OPERATOR'S STRESS TOLERANCE

RESULT #2

OPERATOR'S RESOURCE STUDY

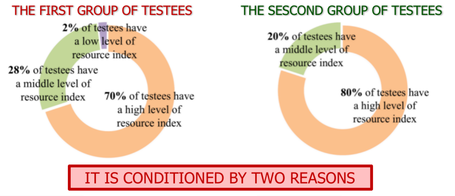
INVESTIGATION

THE STUDY OF THE OPERATOR'S RESOURCES IS A COMPLEX PROCESS SINCE THEY INCLUDE A VARIETY OF MATERIAL OBJECT, EVENTS, PHENOMENA AND HYPOTHETICAL POSSIBILITIES

"RESOURCE INDEX" TEST

FOR PRACTICAL RESEARCH, THE THEORY PROPOSES A METHOD FOR ESTIMATING RESOURCES, WHICH WE ADAPTED WITH AN ALLOWANCE FOR THE FEATURES OF THE "OPERATOR-UAV" SYSTEM

DISTRIBUTION OF TESTEES BY RESOURCE LEVELS



IT IS CONDITIONED BY TWO REASONS

REASON #1

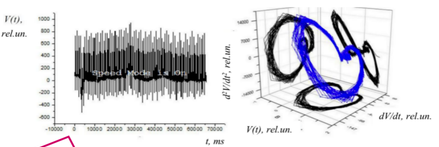
DIFFERENT LEVELS OF UNDERSTANDING BY THE TESTEES OF PRIORITY IN THE CHOICE OF SKILLS NECESSARY FOR SUCCESSFUL MASTERY OF THE PROFESSION

REASON #1

DIFFERENT MOTIVES OF THE TESTEES IN CHOOSING A PROFESSION

RESULT #3

THE GEOMETRISATION OF THE SIGNAL IN THE SPACE OF DYNAMIC EVENTS



THE CHARACTERISTIC FEATURES OF THE SYSTEM ELEMENTS FUNCTIONING, DYNAMIC ORDERING OF THE COMPONENTS OF THE OPERATING CYCLE, AND ENERGY BALANCE OF THE OPERATING CYCLE

THIS APPROACH ALLOWED US TO VISUALISE THE PSYCHO-PHYSIOLOGICAL "PRICE" OF THE TESTEES' STRESS UNDER LEARNING AND THE KNOWLEDGE CONTROL

RESULT #4

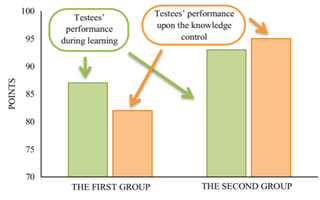
RESEARCHING MODES

TO ANALYSE THE VIABILITY OF THE "OPERATOR-UAV" SYSTEM, WE CREATED TWO TYPES OF CONDITIONS FOR THE SYSTEM FUNCTIONING: **A NORMAL MODE** AND **A COMPLEX MODE**

ESTIMATION

WE ESTIMATED THE EFFECTIVENESS OF THE ACTIVITY BASED ON THE RESULTS OF THE LEARNING AND KNOWLEDGE CONTROL OF THE TESTEES

TESTEES' PERFORMANCE IN VARIOUS CONDITIONS OF ACTIVITY



CONCLUSIONS

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AN EXPERIMENTAL STUDY OF THE **"OPERATOR-UAV" SYSTEM** SHOWED THAT ITS VIABILITY DEPENDS ON THE OPERATOR'S STRESS TOLERANCE AND RESOURCES, WHICH THE OPERATOR USES TO PERFORM WORK TASKS

AN ANALYSIS OF THE REASONS FOR THE LOW EFFICIENCY OF UNMANNED AIRCRAFT SYSTEM OPERATOR TRAINING HAS SHOWN THAT THE KEY REASON IS THE LACK OF A TRANSDISCIPLINARY APPROACH TO TRAINING

HOWEVER, THIS APPROACH WILL TEACH A SPECIALIST TO MANAGE THE HUMAN FACTOR AND FIND NON-STANDARD SOLUTIONS TO PROBLEMS, WHICH, ULTIMATELY, WILL INCREASE THE EFFICIENCY AND SAFETY OF THE UNMANNED AIRCRAFT SYSTEMS

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