

Міністерство освіти і науки України
Український державний університет науки і технологій
Кафедра філології та перекладу

Андрій Безруков

Оксана Боговик

ВИРОБНИЧА ПРАКТИКА

Методичні рекомендації для набуття навичок роботи
за спеціальністю 035 Філологія,
спеціалізацією 035.041 Германські мови та літератури
(переклад включно), перша – англійська



Дніпро
2023

УДК 811.111'33(076.5)

Б 40

Укладачі:

Безруков Андрій Вікторович
Боговик Оксана Аурелівна

Рецензенти:

*Власова П. І., д-р філос. наук, професор,
Український державний університет науки і технологій*

*Ляшук А. М., канд. філол. наук, доцент,
Центральноукраїнський державний педагогічний університет
імені Володимира Винниченка*

А. В. Безруков, О. А. Боговик

Б 40 Виробнича практика : методичні рекомендації для набуття навичок роботи за спеціальністю 035 Філологія, спеціалізацією 035.041 Германські мови та літератури (переклад включно), перша – англійська. Дніпро, 2023. 80 с.

Методичні рекомендації для набуття навичок роботи за спеціальністю 035 Філологія, спеціалізацією 035.041 Германські мови та літератури (переклад включно), перша – англійська призначені для студентів II курсу бакалаврату і вміщують 20 автентичних науково-технічних текстів, а також спеціально розроблені завдання до них. Видання розраховане на 120 годин роботи. Методичні рекомендації укладено з метою забезпечення планомірного керівництва аудиторною та самостійною діяльністю студентів під час проходження виробничої практики.

УДК 811.111'33(076.5)

Рекомендовано методичною комісією економіко-гуманітарного факультету (протокол № 2 від 31.10.2022 р.).

Зареєстровано у навчально-методичному відділі університету (реєстр. № 573 від 23.11.2022 р.).

© А.В. Безруков, О.А. Боговик, 2023
© Український державний університет
науки і технологій, 2023

TABLE OF CONTENTS

| | |
|-------------------|----|
| Preface | 4 |
| Workshop 1 | 5 |
| Workshop 2 | 8 |
| Workshop 3 | 12 |
| Workshop 4 | 15 |
| Workshop 5 | 18 |
| Workshop 6 | 22 |
| Workshop 7 | 25 |
| Workshop 8 | 29 |
| Workshop 9 | 32 |
| Workshop 10 | 36 |
| Workshop 11 | 40 |
| Workshop 12 | 44 |
| Workshop 13 | 47 |
| Workshop 14 | 51 |
| Workshop 15 | 55 |
| Workshop 16 | 59 |
| Workshop 17 | 63 |
| Workshop 18 | 66 |
| Workshop 19 | 69 |
| Workshop 20 | 73 |
| References | 78 |

PREFACE

Translation of scientific and technical texts is one of the most relevant areas in translation studies nowadays. In light of expanding the scope of science, the importance of receiving the actual information, the need to disseminate scientific data obtained in the research, and the accuracy of scientific and technical translation become one of the priorities of the further development of science depends upon. Peculiarities of such a kind of discourse in respect of linguistics are related not only to style but to grammar and lexis. The main lexical characteristic is its specific definitions and terms, terminological phrases, shortened forms, mathematical formulas, etc.

Technical English is a form of standard English that uses technical vocabulary and certain features of style and grammar. As for the vocabulary of technical English, there are a few core words that are common to this writing such as analysis, result, product, process and so on. We have the technical vocabulary of computing, medicine, economics, etc. One more point to note: usual words sometimes take on a specific meaning when used as technical terms.

The language of documents in technical English is not harder to master than the language of non-technical documents. There are a lot of different fields of technical English, but across these fields, there are two main types of documents:

a) semi-technical texts which are aimed at a general reading public, and do not require any high-level understanding of technical matters;

b) documents aimed at specialists in a given field, and require a specialist familiarity with the technicalities of the subject.

The proposed edition is a logical continuation of the edition for first-year students, which aimed to teach students to be able to translate scientific, non-fiction, and technical texts.

Each workshop of this edition includes different tasks for students to study and activate lexical units and phrases in writing, aimed at improving the usage of vocabulary during translation.

THE GRADE SYSTEM AND CONVERSION

| | | |
|-----------------|---------------|------|
| 1–20 workshops: | 90–100 points | (A) |
| 1–18 workshops: | 83–89 points | (B) |
| 1–16 workshops: | 75–82 points | (C) |
| 1–14 workshops: | 66–74 points | (D) |
| 1–12 workshops: | 60–65 points | (E) |
| <12 workshops: | fail | (Ex) |

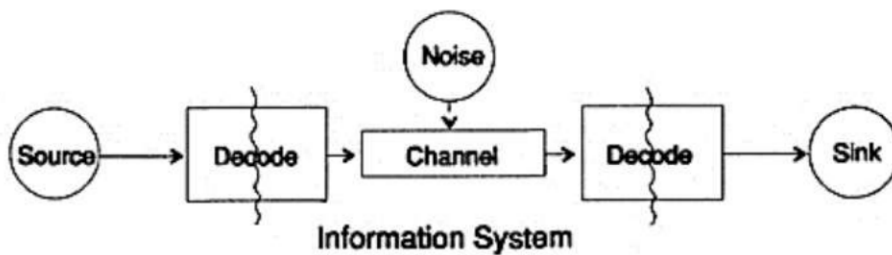
Workshop 1

1. Read the text carefully before doing the tasks below

Turn to the problem of the representation of information – how do we represent the information we want to process. To simplify the problem of the representation of information we will, at present, examine only the problem of the transmission of information from here to there. Transmission through time or through space are the same problem. The standard model of the system is given in Figure 1.

Starting of the left-hand side of Figure 1 we have a source of information. We do not discuss what the source is. It may be a string of: alphabetical symbols, numbers, mathematical formulas, musical notes of a score, the symbols now used to represent dance movements – whatever the source is and what ever “meaning” is associated with the symbols is not part of the theory. We postulate only a source of information, and by doing only that, and no more, we have a powerful, general theory which can be widely applicable. It is the abstraction from details that gives the breadth of application.

Figure 1



When in the late 1940s C. E. Shannon created *Information Theory* there was a general belief he should call it *Communication Theory*, but he insisted on the word “information”, and it is exactly that word which has been the constant source of both interest and of disappointment in the theory. One wants to have a theory of “information” but it is simply a theory of strings of symbols. Again, all we suppose is there is such a source, and we are going to encode it for transmission. The encoder is broken into two parts, the first half is called the *source encoding* which as its name implies is adapted to the source, various sources having possibly different kinds encodings.

The second half of the encoding process is called *channel encoding* and it is adapted to the channel over which the encoded symbols are to be sent. Thus, the second half of the encoding process is tuned to the channel. In this fashion, with the common interface, we can have a wide variety of sources encoded first to the common interface, and then the message is further encoded to adapt it to the particular channel being used.

Next, going to the right in Figure 1, the channel is supposed to have “random noise added”. All the noise in the system is incorporated here. It is

assumed the encoder can uniquely recognize the incoming symbols without any error, and it will be assumed the decoder similarly functions without error. These are idealizations, but for many practical purposes they are close to reality.

Next, the decoding is done in two stages, channel to standard, and then standard to the source code. Finally, it is sent on to the sink, to its destination. Again, we do not ask what the sink does with it.

As stated before, the system resembles transmission, for example a telephone message from me to you, radio, or TV programs, and other things such as a number in a register of a computer being sent to another place. Recall, again, sending through space is the same as sending through time, namely *storage*. If you have information and want it later, you encode it for storage and store it. Later when you want it, it is decoded. Among encoding systems is the identity, no change in the representation.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--------------------------------|--|
| 1 | спростити проблему | |
| 2 | джерело інформації | |
| 3 | рядок з | |
| 4 | бути широко застосованим | |
| 5 | загальне переконання | |
| 6 | вихідне кодування | |
| 7 | бути адаптованим до чогось | |
| 8 | бути включеним | |
| 9 | вхідні символи | |
| 10 | направити до місця призначення | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a transmission, through space, a source, to postulate, a disappointment, an encoder, a channel, a random noise, a storage, an identity

1. String theory describes how strings propagate ... and interact with each other.
2. Never specify any details which may uncover your
3. Friends in the autonomous vehicle industry ... that fully autonomous vehicles will need to be 10 times safer than human-driven cars to be successful and broadly allowed on public roads.
4. They're proteins that are controlling things like ion ... movement.
5. Select here the algorithm method which will used to add ... to the images.
6. Additionally, the images must retain their copyright and ... information.
7. Perhaps the biggest ... is some features in economic part.
8. ... sometimes is tight, but when you switch you can hear the rattle.
9. It might be used for secondary and off-line
10. The signal of ... inside of motor's junction box uses PCB board, also can choose aerial socket.

4. Translate the following sentences into English using the words and word combinations below

to represent the information, close to reality, to be widely applicable, to encode smth, a general belief, to examine the problem, the constant source, a random noise, from here to there, associated with, no change

1. Вони простою мовою пояснюють своїм послідовникам, як дістатися до міста. 2. Веб-сайт – це сучасний інструмент, який репрезентує компанію, а точніше інформацію про неї у мережі Інтернет. 3. Наразі треба провести актуалізацію проблеми, розробити план технічних заходів. 4. У групі, де вживали плацебо, як і очікувалося, не було жодних змін. 5. Іншим негативним наслідком є те, що плацебо може викликати побічні ефекти, пов'язані з реальним лікуванням. 6. Системи промислового очищення і фільтрації знайшли найбільшого розповсюдження у харчовій, медичній і хімічній промисловості. 7. Широко поширена думка, що ми наближаємося до кінця поточного ринкового циклу. 8. Усі живі тканини потребують постійного джерела енергії, що виробляється під час спалювання палива (вуглеводів, жирів, білків). 9. Банківські картки, як правило, кодують саме таким методом. 10. Тут ви можете обрати алгоритм, який буде використано для додавання випадкового шуму до зображень. 11. Цим розробники хотіли показати, що їхня гра максимально наближена до реальності.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

I feel it necessary to point ... how things are actually done ... us when we communicate ideas. Thus, I want, at this time, to get an idea ... my head ... yours. I emit some words from which you are supposed to get the idea. But if you later try to transmit this idea ... a friend you will emit, almost certainly, different words. In a real sense, the “meaning” is not contained in the specific words I use since you will probably use different words to communicate the same idea. Apparently different words can convey the same “information”. But if you say you do not understand the message then usually a different set ... words is used ... the source in a second or even third presentation ... the idea. Thus, again in some sense, the “meaning” is not contained in the actual words I use, but you supply a great deal ... surrounding information when you make the translation ... my words to your idea of what I said inside you head.

We have learned to “tune” the words we use to fit the person ... the receiving end; we, to some extent, select according to what we think is the channel noise, though clearly this does not match the model I am using above since there is significant noise in the decoding process, shall we say. This inability of the receiver to “hear what is said” ... a person in a higher management position but to hear only what they expect to hear, is, of course, a serious problem in every large organization, and is something you should be

keenly aware ... as you rise ... the top of the organization. Thus, the representation ... information in the formal theory we have given is mirrored only partly in life as we live it, but it does show a fair degree ... relevance outside the formal bounds ... computer usage where it is highly applicable.

6. Translate the text from task 1 into Ukrainian.

Workshop 2

1. Read the text carefully before doing the tasks below

Simply stated, a system is an integrated composite of people, products, and processes that provide a capability to satisfy a stated need or objective. Systems engineering consists of two significant disciplines: the technical knowledge domain in which the systems engineer operates, and systems engineering management.

Three commonly used definitions of systems engineering are provided by the best-known technical standards that apply to this subject. They all have a common theme:

- A logical sequence of activities and decisions that transforms an operational need into a description of system performance parameters and a preferred system configuration. MIL-STD- An interdisciplinary approach that encompasses the entire technical effort, and evolves into and verifies an integrated and life cycle balanced set of system people, products, and process solutions that satisfy customer needs.

- An interdisciplinary, collaborative approach that derives, evolves, and verifies a life-cycle balanced system solution which satisfies customer expectations and meets public acceptability. In summary, systems engineering is an interdisciplinary engineering management process that evolves and verifies an integrated, life-cycle balanced set of system solutions that satisfy customer needs.

As illustrated by Figure 1, systems engineering management is accomplished by integrating three major activities:

- Development phasing that controls the design process and provides baselines that coordinate design efforts,

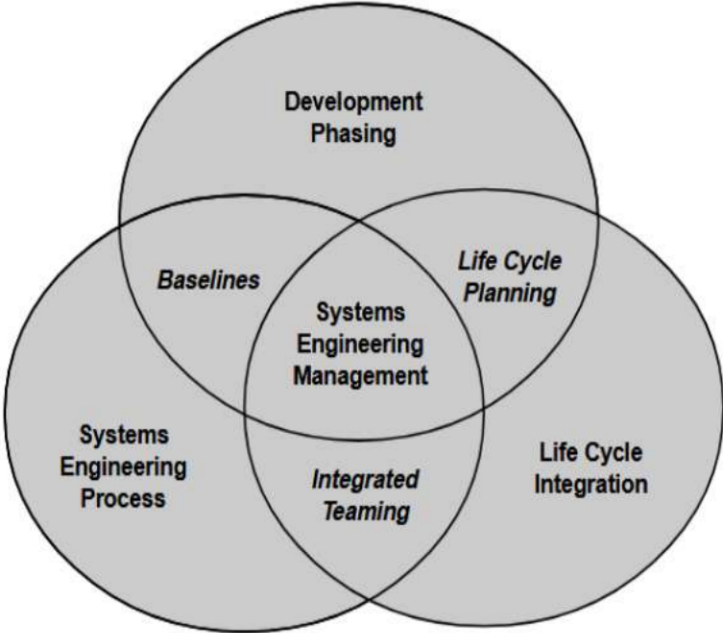
- A system engineering process that provides a structure for solving design problems and tracking requirements flow through the design effort, and

- Life cycle integration that involves customers in the design process and ensures that the system developed is viable throughout its life. Each one of these activities is necessary to achieve proper management of a development effort.

Phasing has two major purposes: it controls the design effort and is the major connection between the technical management effort and the overall acquisition effort. It controls the design effort by developing design baselines that govern each level of development. It interfaces with acquisition management by providing key events in the development process, where design viability can be assessed. The viability of the baselines developed is a major input for acquisition management Milestone (MS) decisions. As a result, the timing and coordination between technical development phasing and the acquisition schedule is critical to maintain a healthy acquisition program. The systems engineering process is the heart of systems engineering management. Its purpose is to provide a structured but flexible process that transforms requirements into specifications, architectures, and configuration baselines. The discipline of this process provides the control and traceability to develop solutions that meet customer needs. The systems engineering process may be repeated one or more times during any phase of the development process.

Life cycle integration is necessary to ensure that the design solution is viable throughout the life of the system. It includes the planning associated with product and process development, as well as the integration of multiple functional concerns into the design and engineering process. In this manner, product cycle-times can be reduced, and the need for redesign and rework substantially reduced.

*Figure 1
Three Activities of Systems Engineering Management*



2. Find the English equivalents in the text and commit them to memory

| | | |
|----|-------------------------------------|--|
| 1 | інтегрована сукупність чогось | |
| 2 | технічний стандарт | |
| 3 | спільна тема | |
| 4 | логічна послідовність дій і рішень | |
| 5 | бажана конфігурація системи | |
| 6 | міждисциплінарний процес управління | |
| 7 | збалансований життєвий цикл | |
| 8 | процес проектування | |
| 9 | базові параметри конфігурації | |
| 10 | інтеграція життєвого циклу | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

an interdisciplinary approach, a design effort, an operational need, the technical knowledge, to develop solutions, to apply to, a stated need, to satisfy customer needs, a common theme, significant disciplines

1. The company also ... for such vehicles on the Ukrainian market. 2. Scholars throughout the University are making ... contributions to their 3. If it is technical translation, then the translator must have 4. But that should ... every major decision. 5. This connection allows to coexist with two seemingly different subjects, separated by centuries, but connected by ... power and personality. 6. For most ... this is okay. 7. ... of the scientific program attracted a large number of doctors of related specialties: neurosurgeons, genetics, psychiatrists, general practitioners and health care organizers. 8. Professional websites and so different from the sites, amateur, they are able to fully 9. ... to upgrade equipment by using EPLAN system. 10. You'll learn to identify problems and leverage technology ... and realize strategic opportunities in any business worldwide.

4. Translate the following sentences into English using the words and word combinations below

a baseline configuration, to evolve into, associated with, to govern, an acquisition, a life cycle, major activities, an engineering management, to provide a capability, an engineering process

1. Сучасні електронні мікроскопи надають унікальні можливості для прямого спостереження за поверхнею подрібненого вуглеволокна. 2. Створюючи особливі умови і втручаючись у структуру ядра клітини, фахівці змушують її розвиватися у потрібну тканину або навіть у цілий організм. 3. Цей період, як правило, називають життєвим циклом проекту.

4. Основні напрями діяльності фонду: здоров'я, освіта, гендерна рівність, соціальне залучення, благодійність. 5. Наші інженерні програми зосереджують увагу на розробці технологічного процесу, систем та виходів. 6. Ми готові представити зацікавленим особам нашу технологію, метод збирання даних і результати досліджень. 7. Адже ці перстні були наділені владою керувати волею народів. 8. Майстер надає вам можливість отримати знання у галузі інженерного управління. 9. Базова конфігурація, відома як «Змішаний логістичний перевізник», використовує один сегмент під тиском і один без тиску, та може нести 7600 кг вантажу. 10. Держава надає підтримку стартапам, що пов'язані з цифровою валютою.

5. Read the extracts below and match the words and their definitions

Manufacturing (Production, Construction) / Disposal / Development / Verification / Deployment (Fielding) / Support / Operation / Training

- (1) ... includes the activities required to evolve the system from customer needs to product or process solutions.
- (2) ... includes the fabrication of engineering test models and “brass boards,” low-rate initial production, full-rate production of systems and end items, or the construction of large or unique systems or subsystems.
- (3) ... includes the activities necessary to initially deliver, transport, receive, process, assemble, install, checkout, train, operate, house, store, or field the system to achieve full operational capability.
- (4) ... is the user function and includes activities necessary to satisfy defined operational objectives and tasks in peacetime and wartime environments.
- (5) ... includes the activities necessary to provide operations support, maintenance, logistics, and material management.
- (6) ... includes the activities necessary to ensure that the disposal of decommissioned, destroyed, or irreparable system components meets all applicable regulations and directives.
- (7) ... includes the activities necessary to achieve and maintain the knowledge and skill levels necessary to efficiently and effectively perform operations and support functions.
- (8) ... includes the activities necessary to evaluate progress and effectiveness of evolving system products and processes, and to measure specification compliance.

6. Translate the text from task 1 into Ukrainian.

Workshop 3

1. Read the text carefully before doing the tasks below

Specific output thresholds have been boosted to 6950 kW/cylinder by MAN B&W Diesel's 1080 mm bore MC/ME two-stroke designs. A single 14-cylinder model can thus deliver up to 97 300 kW for propelling projected 10 000 TEU-plus containerships with service speeds of 25 knots-plus. (The largest containerships of the 1970s typically required twin 12-cylinder low speed engines developing a combined 61 760 kW). Both MAN B&W Diesel and Wärtsilä Corporation (Sulzer) have extended their low-speed engine programmes from the traditional 12-cylinder limit to embrace 14-cylinder models. Power ratings in excess of 100 000 kW are mooted from extended in-line and V-cylinder versions of established low speed engine designs. V-configurations, although not yet in any official programme, promise valuable savings in weight and length over in-line cylinder models, allowing a higher number of cylinders (up to 18) to be accommodated within existing machinery room designs. Even larger bore sizes represent another route to higher powers per cylinder. Engine development has also focused on greater fuel economy achieved by a combination of lower rotational speeds, higher maximum combustion pressures and more efficient turbochargers. Engine thermal efficiency has been raised to over 54 per cent and specific fuel consumptions can be as low as 155 g/kWh. At the same time, propeller efficiencies have been considerably improved due to minimum engine speeds reduced by more than 40 per cent to as low as 55 rev/min.

The pace and expense of development in the low-speed engine sector have been such that only three designer/licensors remain active in the international market. The roll call of past contenders includes names either long forgotten or living on in other fields: AEG-Hesselman, Deutsche Werft, Fullagar, Krupp, McIntosh and Seymour, Neptune, Nobel, North British, Polar, Richardsons Westgarth, Still, Tosi, Vickers, Werkspoor and Worthington. The most recent casualties were Doxford, Götaverken and Stork, some of whose products remain at sea in dwindling numbers. These pioneering designers displayed individual flair within generic classifications which offered two-or four-stroke, single-or double-acting, and single-or opposed-piston arrangements. The Still concept even combined the Diesel principle with a steam engine: heat in the exhaust gases and cooling water was used to raise steam which was then supplied to the underside of the working piston.

Evolution has decreed that the surviving trio of low-speed engine designers (MAN B&W, Mitsubishi and Sulzer) should all settle – for the present at least – on a common basic philosophy: uniflow-scavenged, single hydraulically-actuated exhaust valve in the head, constant pressure turbocharged, two-stroke crosshead engines exploiting increasingly high stroke/bore ratios (up to 4.2:1)

and low operating speeds for direct coupling to the propeller. Bore sizes range from 260 mm to 1080 mm.

In contrast the high/medium speed engine market is served by numerous companies offering portfolios embracing four-stroke, trunk piston, uniflow- or loop-scavenged designs, and rotating piston types, with bore sizes up to 640 mm. Wärtsilä's 64 engine – the most powerful medium speed design – offers a rating of over 2000 kW/cylinder from the in-line models.

Recent years have seen the development of advanced medium- and high-speed designs with high power-to-weight ratios and compact configurations for fast commercial vessel propulsion, a promising market.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|----------------------------------|--|
| 1 | результат граничних показників | |
| 2 | двотактні конструкції | |
| 3 | з робочою швидкістю | |
| 4 | номінальна потужність | |
| 5 | суттєва економія ваги та довжини | |
| 6 | машинне відділення | |
| 7 | швидкість обертання | |
| 8 | поршневі конструкції | |
| 9 | пряме з'єднання з гвинтом | |
| 10 | відповідні зразки | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a promising market, a steam engine, a fuel economy, a working piston, fuel consumptions, efficient turbochargers, low speed engines, to boost to, exhaust gases, a cylinder model

1. The power output of the 1200, which remained in production alongside the 12/50, was subsequently ... 48 bhp. 2. Several complicated, but perfect in its technical solution, 2-... Lanchester ahead of their competitors, due to its reliability, softness and ease of operation. 3. A feature of these spacecraft is that they can use the Earth's magnetic field for 4. All Ingenium engines will be equipped with advanced and ..., central direct high-pressure fuel injection, variable valve timing and start-stop technology. 5. After starting the GPS monitoring ... decrease for 15–20 % as usually. 6. The ... in the higher gears reduce the noise level inside the vehicle. 7. The car was to use ... powered by uranium fission similar to how nuclear submarines work. 8. According to statistics, trucks and buses produce more *exhaust gases* than cars. 9. The change of pressure, in turn, moves the 10. We position Ukraine as a technological partner, as a promising market, as a country of innovation.

4. Translate the following sentences into English using the words and word combinations below

combustion pressures, casualties, a fuel economy, a containership, an international market, an official programme, higher powers, a steam engine, exhaust gases, a high speed

1. Сигнал у мережі рухається досить швидко. 2. Згідно зі статистикою, вантажні машини і автобуси виробляють більше вихлопних газів, ніж легкові автомобілі. 3. Зараз дедалі більше компаній хочуть вийти на міжнародний ринок, охопити своїми послугами і товарами весь світ. 4. Форсунки призначені для розпилювання змішаного з повітрям палива, що поступає у циліндри двигуна внутрішнього згоряння під великим тиском. 5. Під релігією розуміють специфічне усвідомлення навколишньої дійсності, яке засноване на вірі у вищі сили. 6. Офіційна програма розпочнеться о 10:00 30 квітня зі зречення королеви Беатрікс від престолу, після чого королівська сім'я з'явиться на балконі палацу. 7. Морський термінал вміщує контейнеровози та малі (150 тон) вантажні судна. 8. Економія палива також залежить від того, для чого ви використовуєте свій автомобіль. 9. В останні дні кількість обстрілів і жертв на фронті різко збільшилася. 10. Він був інженером і винахідником, його найвідоміший винахід – сучасний паровий двигун.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

Fuel is injected ... the precise quantity and ... exactly the moment required ... the conditions ... which the engine is operating. The pump's intake flow throttle ensures that only the precise amount ... fuel required is pressurized, resulting in a very high pump efficiency and consequently low fuel consumption. The advantages ... the common rail injection system are fully exploited in conjunction ... the engine control system. The flexibility ... the injection system ... respect to injection pressure and timing allows the option to access and optimize the engine operating parameters throughout the performance map (addressing fuel consumption and emissions, ... example). ... each operating condition ... the engine the engine control system analyses the sensor information and computes them into a setting ... system fuel pressure, injection start and timing. The computed data takes into account engine speed, power demand and transient operating conditions, such as engine warm-up after cold starting. The scope also embraces surrounding conditions and possible faults in the drive system, with appropriate countermeasures automatically being initiated. In addition, the engine control system monitors the limits to certain operating parameters (maximum pressure ... the fuel system, for example) to avoid component damages.

6. Translate the text from task 1 into Ukrainian.

Workshop 4

1. Read the text carefully before doing the tasks below

There are two basic types of blast forces which occur simultaneously in a nuclear detonation blast wave; these are direct blast wave overpressure forces, measured in terms of atmospheres of overpressure; and indirect blast wind drag forces, normally measured in the velocities of the winds which cause them. The most important blast effects, insofar as production of casualties requiring medical treatment is concerned, will be those due to the blast wind drag forces. However, direct blast effects can contribute significantly to the immediate deaths and injuries sustained close to the point of detonation. Personnel in fortifications or unbuttoned armored vehicles who are protected from radiation and thermal and blast wind effects, may be subjected to complex patterns of direct overpressures since blast waves may be reflected and reinforced within them. Blast effects will also be present to a much lesser extent when an RDD uses a conventional explosive as the dispersal mechanism.

a. *Direct Blast Injury.* When the blast wave acts directly upon a resilient target such as the human body, rapid compression and decompression result in transmission of pressure waves through the tissues. These waves can be quite severe and will result in damage primarily at junctions between tissues of different densities (bone and muscle) or at the interface between tissue and air spaces (lung tissue and the gastrointestinal [GI] system). Perforation of the eardrums would be a common, but a minor blast injury.

b. *Indirect Blast Wind Drag Forces.* The drag forces of blast winds are proportional to the velocities and duration times of those winds, which in turn vary with distance from the point of detonation, yield of the weapon, and altitude of the burst. These winds are relatively short in duration but are extremely severe and may reach several hundred km per hour. Indirect blast injuries will occur as crush and translational injuries, and as missile injuries. Casualties will be thrown against immobile objects and impaled by flying debris; therefore, solid organ, extremity, and head injuries will be commonplace. The distance from the point of detonation at which severe indirect injury will occur is considerably greater than that for serious direct blast injuries.

(1) *Crush and translational injuries.* The drag forces of the blast winds are strong enough to displace even large objects, such as vehicles, or to cause the collapse of large structures, such as buildings. These events can result in very serious crush injuries, similar to injuries seen in earthquakes and conventional bombings. A human body can itself become a missile, and be displaced a variable distance and at variable velocities depending upon the intensity of the drag forces and the nature of the environment. The resulting injuries sustained are termed translational injuries. The probability and the severity of the injury depend on the velocity of the human body at the time of impact.

(2) Missile injury. The number of missiles that can be generated by the blast winds depends to some extent upon the environment, that is, different terrain types will have different quantities of material available for missile production. However, the drag forces of the blast winds produced by nuclear detonations are so great that almost any form of vegetation or structure, if present, will be broken apart or fragmented into a variety of missiles. Multiple and varied missile injuries will be common. The probability of a penetrating injury increases with increasing velocity, particularly for small, sharp missiles such as glass fragments. Heavier objects require higher kinetic energies to penetrate, therefore, heavy blunt missiles will not ordinarily penetrate the body, but can result in significant injury, particularly fractures.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|-------------------------|--|
| 1 | сила вибуху | |
| 2 | швидкість вітру | |
| 3 | наслідки вибуху | |
| 4 | місце детонації | |
| 5 | особовий склад | |
| 6 | механізм розсіювання | |
| 7 | шлунково-кишковий тракт | |
| 8 | потужність зброї | |
| 9 | звичне явище | |
| 10 | пряме ушкодження | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

immediate deaths, different densities, eardrums, to require medical treatment, armored vehicles, blast effects, flying debris, extremely severe, basic types, to occur simultaneously

1. However, four ... of temperament can be used for the study of individuality.
2. Nowadays the world is in the process of transformation and goes through several types of crises that ...: social, resources, socio-systemic, economic.
3. However, other injuries ... intervention can also occur.
4. It is however not to be confused with a nuclear explosion, such as a fission bomb, which by releasing nuclear energy produces ... far in excess of what is achievable by the use of conventional explosives.
5. Not all poisoning results in
6. She proposed the construction of five ... with a common chassis and different functions.
7. By making exquisitely precise measurements astronomers have found that different parts of the asteroid Itokawa have
8. The victim after the incident, went to doctors, who recorded his rupture
9. The laws here are
10. The pilot immediately banked his aircraft sharp to the left to avoid

4. Translate the following sentences into English using the words and word combinations below

a detonation, in earthquakes, to be broken apart, complex patterns, particularly fractures, kinetic energies, a lesser extent, nature of the environment, protected from radiation, different terrain types, to become a missile

1. Цієї системи навчали каліфорнійських рятувальників для використання під час землетрусів. 2. Другою одиницею, що розробляється, має стати крилата ракета морського базування, також оснащена ядерним зарядом. 3. Рішення проблеми раціонального використання біологічних ресурсів, охорони природи та навколишнього середовища можливо лише із залученням біології. 4. Такий камуфляж високоефективний, але не універсальний, адже переміщення до іншої місцевості, як правило, демаскує мисливця. 5. Гнів його вогнем розливається, і скелі розпадаються перед ним. 6. Атоми і молекули постійно перебувають у русі, тому вони мають кінетичну енергію. 7. Найбільш поширеною причиною рецидивного менінгіту є перелом черепа, а саме переломи, що впливають на основу черепа чи поширюються до навколоносових пазух та пірамід скроневої кістки. 8. Я повернулася до мого будинку, повністю захищена від радіації, тому що знала, що це не може заподіяти мені шкоди. 9. Це може також вплинути на дорослих, але у меншому ступені. 10. У разі вибуху ядерної боєголовки можливе покриття зони ураження небезпечними матеріалами.

5. Read the extracts below and choose the title to each paragraph

Erythema / Hyperthermia / Neurologic Dysfunction / Hypotension

(1) Casualties who have received a potentially lethal radiation injury show a significant rise in body temperature within the first few hours postexposure. Although the number of cases is few and is frequently overlooked, this condition appears to be a consistent finding. The occurrence of fever and chills within the first day postexposure is associated with a severe life-threatening radiation dose. Hyperthermia may occur in patients who receive lower, but still serious radiation doses (200 cGy or more).

(2) A person who has received a whole-body dose of more than 1000 cGy will develop erythema within the first day postexposure. Erythema is less frequently seen with lower doses (200 cGy or more).

(3) A noticeable and sometimes clinically significant decline in systemic blood pressure has been recorded in victims who have received a supralethal whole body radiation dose. A severe hypotensive episode was recorded in one person who had received several thousand cGy. In persons who received several hundred cGy, a drop in systemic blood pressure of more than 10 percent has been noted. Severe hypotension after irradiation is associated with lethal injury.

However, if the radiation dose has been determined to be less than 1000 cGy, then a physical injury should be suspected as being responsible for the hypotension.

(4) Experience indicates that almost all persons who demonstrate obvious signs of damage to the CNS within the first hour postexposure have received a supralethal dose. Symptoms include mental confusion, convulsions, and coma. Intractable hypotension will probably accompany these symptoms. Without aggressive medical support, these patients succumb within 48 hours.

6. Translate the text from task 1 into Ukrainian.

Workshop 5

1. Read the text carefully before doing the tasks below

Why learn about aerodynamics? For an answer, just take a look at the following five photographs showing a progression of airplanes over the past 70 years. The Douglas DC-3 (Figure 1), one of the most famous aircraft of all time, is a low-speed subsonic transport designed during the 1930s. Without a knowledge of low-speed aerodynamics, this aircraft would have never existed. The Boeing 707 (Figure 2) opened high-speed subsonic flight to millions of passengers beginning in the late 1950s. Without a knowledge of high-speed subsonic aerodynamics, most of us would still be relegated to ground transportation. The Bell X-1 (Figure 3) became the first piloted airplane to fly faster than sound. Without a knowledge of transonic aerodynamics (near, at, and just above the speed of sound), neither the X-1, nor any other airplane, would have ever broken the sound barrier.

The Lockheed F-104 (Figure 4) was the first supersonic airplane point-designed to fly at twice the speed of sound, accomplished in the 1950s. The Lockheed-Martin F-22 (Figure 5) is a modern fighter aircraft designed for sustained supersonic flight. Without a knowledge of supersonic aerodynamics, these supersonic airplanes would not exist. Finally, an example of an innovative new vehicle concept for high-speed subsonic flight is the blended wing body shown in Figure 6. The airplanes in Figures 1–6 are six good reasons to learn about aerodynamics, especially about low-speed aerodynamics, high-speed subsonic aerodynamics, transonic aerodynamics, supersonic aerodynamics, and more.

Airplanes are by no means the only application of aerodynamics. The air flow over an automobile, the gas flow through the internal combustion engine powering an automobile, weather and storm prediction, the flow through a

windmill, the production of thrust by gas turbine jet engines and rocket engines, and the movement of air through building heater and air-conditioning systems are just a few other examples of the application of aerodynamics.

Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



To learn a new subject, you simply have to start at the beginning. For example, how does nature reach out and grab hold of an airplane in flight – or any other object emmersed in a flowing fluid – and exert an aerodynamic force on the object? The resultant aerodynamic force is frequently resolved into two components defined as lift and drag; but rather than dealing with the lift and drag forces themselves, aerodynamicists deal instead with lift and drag coefficients. What is so magic about lift and drag coefficients? What is a Reynolds number? Mach number? Inviscid flow? Viscous flow? These rather mysterious sounding terms will be demystified. They and others constitute the language of aerodynamics, and as we all know, to do anything useful you have to know the language.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--|--|
| 1 | розвиток чогось | |
| 2 | низькошвидкісний дозвуковий транспортний засіб | |
| 3 | наземний транспорт | |
| 4 | долати звуковий бар'єр | |
| 5 | удвічі більше швидкості звуку | |
| 6 | тривалий надзвуковий політ | |
| 7 | інноваційна концепція автомобіля | |
| 8 | двигун внутрішнього згоряння | |
| 9 | газотурбінний реактивний двигун | |
| 10 | системи обігріву та кондиціонування повітря | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

an aircraft, viscous, rocket engines, to be demystified, inviscid, to be relegated to, an air flow, a movement of air, an application of, a high-speed subsonic

1. Non-combat ... are ... not designed for combat as their primary function, but may carry weapons for self-defense. 2. Due to such devices is provided by flying ... to a range of at least 185 km, depending on the profile. 3. The above suggests that the problem of psychological rehabilitation for Ukraine's soldiers should not ... the back burner. 4. Selective ... of any law is a direct threat to everyone. 5. Research concerns of ... velocity and temperature decreasing coefficients determination. 6. NASA was attracted by the idea of using potentially cheaper ... that are offered by this company. 7. Forests slow down ... in the lower layers of the atmosphere. 8. Gases can often be assumed to be 9. ... consistency of the heater allows you to paint even on vertical walls. 10. Pinot noir is a symbol of all the aesthetic that is in wine, which is why he wants to ... first of all.

4. Translate the following sentences into English using the words and word combinations below

to take a look, a subsonic flight, transonic aerodynamics, a modern fighter aircraft, a wing and a body, resolved into, a lift and a drag, coefficients, to constitute, to fly faster than sound

1. Коли будь-який моральний виклик врешті-решт зводиться до бінарного вибору між тим, що є правильно, і тим, що є неправильно, результат обумовлений тим, якими людьми ми є. 2. Підйом і опір можуть бути врівноважені миттєвими рухами, які у літаках все ще вимагають порівняно

громіздких змін закрилків і елеронів. 3. Норвежці встановили рекорд, виконавши найбільший трансатлантичний політ на дозвуковому літаку. 4. З'ясувалося, що розставляти коефіцієнти у хімічних рівняннях не так і складно. 5. Літаки з прямими рейсами не завжди летять швидше, ніж ті, що з пересадкою. 6. Китай продовжуватиме нарощування своїх збройних сил, купуючи сучасну зброю, включно з бойовими літаками, модернізованими підводними човнами, а також збільшуючи кількість балістичних ракет. 7. Збільшені крила і корпуси дзеркал, пофарбовані в колір кузова, надають зовнішньому вигляду автомобіля завершеності. 8. Тож спочатку проаналізуємо цю ідею, і розглянемо амінокислоти і деякі інші карбонові кислоти. 9. Вона обробляла дані експериментів у відділі дозвуково-трансзвукової аеродинаміки у Ленглі. 10. Темна енергія має складати значну частину так званої прихованої маси Всесвіту.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

A distinction between solids, liquids, and gases can be made ... a simplistic sense as follows. Put a solid object ... a larger, closed container. The solid object will not change; its shape and boundaries will remain the same. Now put a liquid ... the container. The liquid will change its shape to conform to that ... the container and will take ... the same boundaries as the container ... the maximum depth ... the liquid. Now put a gas inside the container. The gas will completely fill the container, taking on the same boundaries as the container.

The word fluid is used ... denote either a liquid or a gas. A more technical distinction between a solid and a fluid can be made ... follows. When a force is applied tangentially to the surface ... a solid, the solid will experience a finite deformation, and the tangential force per unit area – the shear stress – will usually be proportional to the amount ... deformation. In contrast, when a tangential shear stress is applied to the surface ... a fluid, the fluid will experience a continuously increasing deformation, and the shear stress usually will be proportional ... the rate of change ... the deformation.

The most fundamental distinction between solids, liquids, and gases is at the atomic and molecular level. In a solid, the molecules are packed so closely together that their nuclei and electrons ... a rigid geometric structure, “glued” together ... powerful intermolecular forces. In a liquid, the spacing between molecules is larger, and although intermolecular forces are still strong, they allow enough movement ... the molecules to give the liquid its “fluidity.”

6. Translate the text from task 1 into Ukrainian.

Workshop 6

1. Read the text carefully before doing the tasks below

Fundamentals of fluid mechanics. A fluid is a substance, such a liquid or a gas, that changes its shape rapidly and continuously when acted on by forces. Fluid mechanics is the science that study how the fluid qualities respond to such forces and what forces the fluid applies to solids in contact with the fluid.

Many of the fundamental laws of fluid mechanics apply to both liquid and gases. Liquids are nearly incompressible. Unlike a gas, the volume of a given mass of the liquid remains almost constant when a pressure is applied to the fluid. The interest herein is centered in gases since the atmosphere in which operate is a gas commonly known as air. Air is a viscous, compressible fluid composed mostly by nitrogen (78 %) and oxygen (21 %). Under some conditions (for instance, at low flight velocities), it can be considered incompressible.

Gas: A gas consists of a large number of molecules in random motion, each molecule having a particular velocity, position, and energy, varying because of collisions between molecules. The force per unit created on a surface by the time rate of change of momentum of the rebounding molecules is called the pressure. As long as the molecules are sufficiently apart so that the intermolecular magnetic forces are negligible, the gas acts as a continuous material in which the properties are determined by a statistical average of the particle effects. Such a gas is called a perfect gas.

Stream line: The air as a continuous fluid flow under determined patterns confined into a finite space (the atmosphere). The curves tangent to the velocity vector of the flow at each point of the fluid in an instant of time are referred to as streamlines. Two streamlines cannot cross each other except in points with null velocity, otherwise will mean that one point has two different velocities.

Stream tube: A stream tube is the locus of the streamlines which pass through a closed curve in a given instant. The stream tube can be though as a pipe inside the fluid, through its walls there is no flow.

In many occasions occurs that the density of a fluid does not change due to the fact that it is moving. This happens in liquids and, in some circumstances, in gases (think in the air confined in a room). Notice that one cannot say that the air is incompressible, but an air flow is incompressible.

The movement of air in which the velocity is inferior to 100 [m/s] can be considered incompressible. When the air moves faster, as is the case in a jet airplane, the flow is compressible and the studies become more complicated as it will be seen in posterior courses.

Viscosity is a measure of the resistance of a fluid which is being deformed by either shear or tensile stress. Every single fluid inherently has viscosity. The less viscous the fluid is, the easier is the movement (fluidity). For instance, it is

well known that the honey has low fluidity (high viscosity), while water presents, compared to honey, high fluidity (low viscosity). Viscosity is a property of the fluid, but affects only if the fluid is under movement. Viscosity describes a fluid's internal resistance to flow and may be thought as a measure of fluid friction. In general, in any flow, layers move at different velocities and the fluid's viscosity arises from the shear stress between the layers that ultimately opposes any applied force.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|----------------------------|--|
| 1 | гідромеханіка | |
| 2 | що контактують з рідиною | |
| 3 | фундаментальний закон | |
| 4 | об'єм зазначеної маси | |
| 5 | інтерес зосереджений на | |
| 6 | складатися переважно з | |
| 7 | хаотичний рух | |
| 8 | бути на достатній відстані | |
| 9 | обмежений простір | |
| 10 | лінія струму | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a substance, to change shape, to apply to, a pressure, to consist of a large number of, a change of momentum, rebounding, incompressible, posterior, internal resistance

1. If you look up at the moon at night, you would have noticed that it ... every day. 2. It includes ... very similar in quality to antioxidants. 3. Occasionally it follows the course of the occipital artery and ends in the internal jugular; in other instances, it joins the ... auricular vein and through it opens into the external jugular vein. 4. Other benefits associated with low ... provide high power density and fast charging capability. 5. At the time this seemed reasonable as the Japanese economy was ... after a 30-month recession. 6. Now this ... can come about with a LARGE FORCE acting over a small time or a small force acting over a LONG TIME. 7. Power (both light and energy), and consequently, the scope of the fluorescent lamp is determined by ... medium. 8. The display option you choose ... all documents you open or create. 9. According to its mission, is a specialized technique that ... complex elements, parts, engines. 10. Three-dimensional flow of a viscous ... fluid in a cylindrical duct with two diaphragms.

4. Translate the following sentences into English using the words and word combinations below

viscosity, a velocity vector, ultimately, a statistical average of, collisions between, commonly-known, confined into, to pass through, property of the fluid, targeted to, stream tube

1. В'язкість вимірюється спеціальними приладами. 2. В'язкість є властивістю рідини, яка позначає швидкість, з якою урівноважуються локальні імпульси. 3. Це стало приводом ще для кількох досліджень, які врешті-решт призвели до заборони препарату. 4. Терагерцове випромінення може проникати крізь одяг, папір, картон, дерево, мур, пластик і кераміку. 5. Нормальне прискорення характеризує швидкість зміни напрямку вектору швидкості (характеризує зміну швидкості за напрямком). 6. У школі нас залучають до системи, яка, як нам здається, має навчити всього. 7. Інвестиції спрямовані на зниження шкідливих викидів у атмосферу. 8. Ми маємо також пам'ятати, що ми говоримо про статистичні середні величини. 9. З цими уявленнями пов'язане народне поняття «народитися під щасливою зіркою». 10. Ми створили канали для деескалації, щоб уникнути зіткнень між нашими силами.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

If one observes the flow ... an airfoil, it will be seen that fluid particles ... contact with the airfoil have null relative velocity. However, the velocity ... the particles ... a (relatively low) distance is approximately the velocity of the exterior stream. This thin layer, in which the velocity perpendicular ... the airfoil varies dramatically, is known as boundary layer and plays a very important role.

The aerodynamic boundary layer was first defined ... Ludwig Prandtl in 1904 Prandtl. It allows to simplify the equations ... fluid flow ... dividing the flow field ... two areas: one inside the boundary layer, where viscosity is dominant and the majority ... the drag experienced by a body immersed in a fluid is created, and one outside the boundary layer where viscosity can be neglected without significant effects ... the solution. This allows a closed-form solution ... the flow ... both areas, which is a significant simplification ... the solution of the full Navier-Stokes equations. The majority ... the heat transfer to and from a body also takes place within the boundary layer, again allowing the equations to be simplified ... the flow field outside the boundary layer. In high-performance designs, such as commercial transport aircraft, much attention is paid to controlling the behavior ... the boundary layer to minimize drag. Two effects have to be considered. First, the boundary layer adds to the effective thickness ... the body through the displacement thickness, hence increasing the pressure drag. Secondly, the shear forces ... the surface ... the wing create skin friction drag.

6. Translate the text from task 1 into Ukrainian.

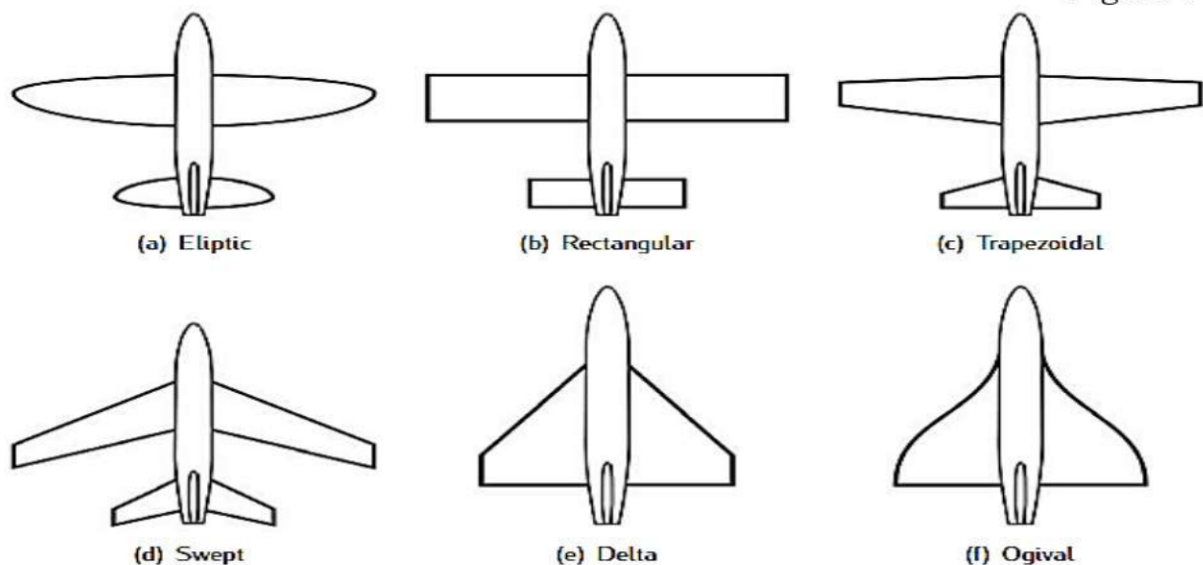
Workshop 7

1. Read the text carefully before doing the tasks below

A wing is an airfoil that has an aerodynamic cross-sectional shape producing a useful lift to drag ratio. A wing's aerodynamic quality is expressed as its lift-to-drag ratio. The lift that a wing generates at a given speed and angle of attack can be one to two orders of magnitude greater than the total drag on the wing. A high lift-to-drag ratio requires a significantly smaller thrust to propel the wings through the air at sufficient lift.

The wing can be classified attending at the plan-form. The elliptic plan-form is the best in terms of aerodynamic efficiency (lift-to-drag ration), but it is rather complex to manufacture. The rectangular plan-form is much easier to manufacture but the efficiency drops significantly. An intermediate solution is the wing with narrowing (also referred to as trapezoidal wing or tapered wing). As the airspeed increases and gets closer to the speed of sound, it is interesting to design swept wings with the objective of retarding the effects of sharpen increase of aerodynamic drag associated to transonic regimens, the so-called compressibility effects. The delta wing is less common, typical of supersonic flights. An evolution of the delta plant-form is the ogival plant-form (Figure 1).

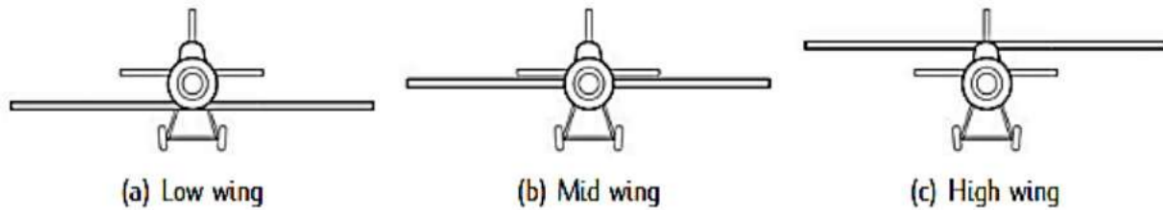
Figure 1



Attending at the vertical position, the wing can also be classified as high, medium, and low. High wings are typical of cargo aircraft. It allows the fuselage to be nearer the floor, and it is easier to execute load and download tasks. On the contrary, it is difficult to locate space for the retractile landing gear (also referred to as undercarriage). The low wing is the typical one in commercial aviation. It does not interfere in the passenger cabin, diving the deck into two spaces. It is also useful to locate the retractile landing gear. The medium wing is

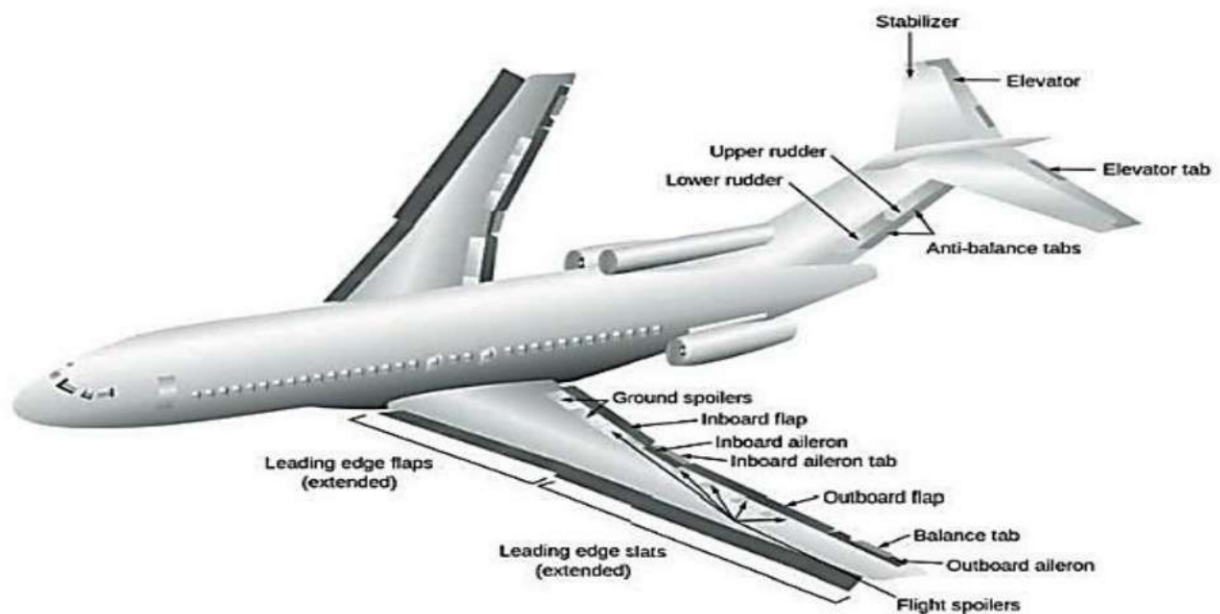
not typical in commercial aircraft, but it is very common to see it in combat aircraft with the weapons below the wing to be dropped (Figure 2).

Figure 2



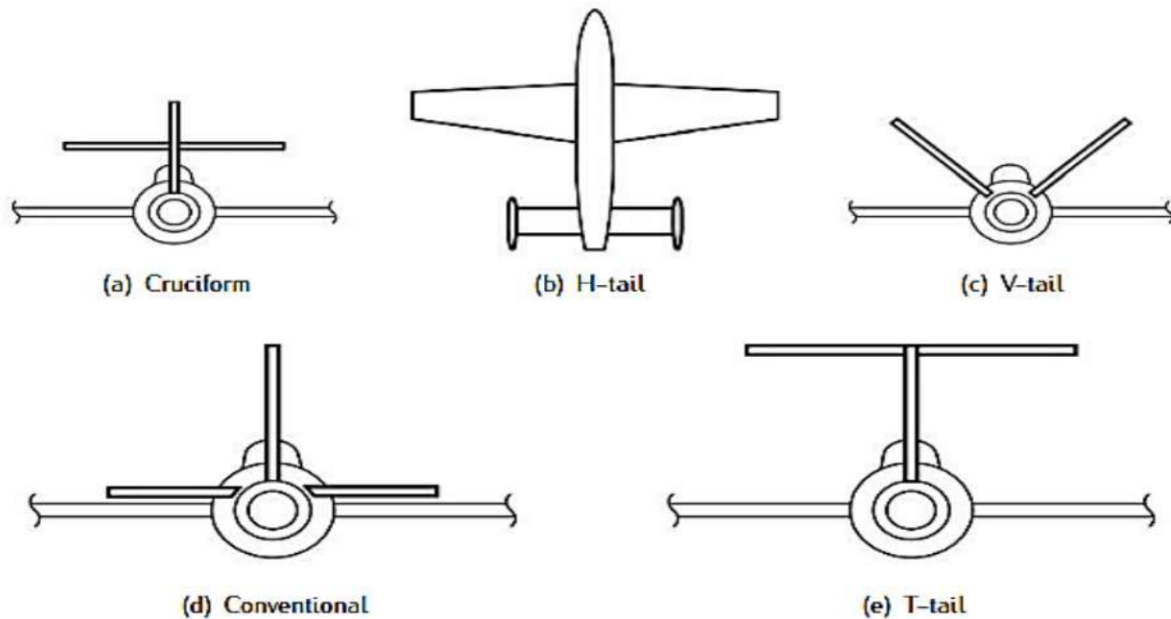
Usually, aircraft's wings have various devices, such as flaps or slats, that the pilot uses to modify the shape and surface area of the wing to change its aerodynamic characteristics in flight, or ailerons, which are used as control surfaces to make the aircraft roll around its longitudinal axis. Another kind of devices are the spoilers which typically used to help braking the aircraft after touching down. Spoilers are deflected so that the lift gets reduced in the semi-wing they are acting, and thus they can be also useful to help the aircraft rolling. If both are deflected at the same time, the total lift of the aircraft drops and can be used to descent quickly or to brake after touching down Figure 3.

Figure 3



The empennage, also referred to as tail or tail assembly, gives stability to the aircraft. Most aircraft feature empennage incorporating vertical and horizontal stabilizing surfaces which stabilize the flight dynamics of pitch and yaw as well as housing control surfaces. Different configurations for the empennage can be identified (Figure 4).

Figure 4



The conventional tail (also referred to as low tail) configuration, in which the horizontal stabilizers are placed in the fuselage. It is the conventional configuration for aircraft with the engines under the wings. It is structurally more compact and aerodynamically more efficient.

The cruciform tail, in which the horizontal stabilizers are placed midway up the vertical stabilizer, giving the appearance of a cross when viewed from the front. Cruciform tails are often used to keep the horizontal stabilizers out of the engine wake, while avoiding many of the disadvantages of a T-tail.

The T-tail configuration, in which the horizontal stabilizer is mounted on top of the fin, creating a 'T' shape when viewed from the front. T-tails keep the stabilizers out of the engine wake, and give better pitch control. T-tails have a good glide ratio, and are more efficient on low-speed aircraft. However, T-tails are more likely to enter a deep stall, and is more difficult to recover from a spin. T-tails must be stronger, and therefore heavier than conventional tails. T-tails also have a larger cross section. Twin tail (also referred to as H-tail) or V-tail are other configuration of interest although much less common.

2. Find the English equivalents in the text and commit them to memory

| | | |
|---|-----------------------------|--|
| 1 | рухати крила | |
| 2 | достатня підйомна сила | |
| 3 | горизонтальний стабілізатор | |
| 4 | проміжне рішення | |
| 5 | шасі | |

| | | |
|----|-----------------------|--|
| 6 | трапецієподібне крило | |
| 7 | крило конічної форми | |
| 8 | хрестоподібний хвіст | |
| 9 | вантажний літак | |
| 10 | різні пристрої | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

an evolution of, an airfoil, an aerodynamic quality, to generate at, to be classified, an aerodynamic efficiency, an airspeed, a compressibility, to be nearer, commercial aviation

1. Though the short test flight lasted just 15 minutes, it was enough to show that electric-powered aircraft have a future in 2. In the air the ... of the aircraft were increased by the use of a forked tail. 3. I think that ... relations between state and church still continues. 4. A single transaction may include cash flows that ... differently. 5. Enormous energy is directed into the central part of the atom and this ... atomic pressure. 6. Others move into London and rent to ... to children and grandchildren. 7. At low density altitude and light loading, best performance is achieved from a slight decrease in normal 8. The most advanced fully integrated wing design sporting highly distinctive and super-efficient winglets for greater 9. Surprisingly, its tail was vertical, and it had ... cross-section, which qualified it to be a model airplane. 10. ... is a capability of powder to assume under pressure effect a required shape and to keep it.

4. Translate the following sentences into English using the words and word combinations below

a surface area, aerodynamic characteristics, a longitudinal axis, kind of devices, a total lift, different configurations for, the conventional configuration, the appearance of a cross, a deep stall, much less common

1. Визначаються сумарні і розподілені аеродинамічні характеристики ракет з урахуванням впливу прилеглих стартових споруд і конструкцій та нерівномірності приземного вітрового потоку. 2. Перший вид пристроїв встановлюють у будь-якому придатному місці будинку або відводять для них окрему котельню. 3. Церква мала вигляд цивільної будівлі з хрестом на бані, який свідчив про її культове призначення. 4. Якщо загальна сила підйому залишається постійною, її вертикальний компонент зменшиться. 5. Завдяки їй ви зможете за допомогою гвинта хомута регулювати нахил поздовжньої осі. 6. Не маючи достатньо місця для використання звичайної конфігурації з паралельно розташованими ліфтовими шахтами, компанія спроектувала систему двоповерхових ліфтів. 7. У соснах такі кишені зустрічаються набагато рідше. 8. Повернення літаків відбувається за

рахунок глибокого звалювання при виконанні посадки і мережі на посадковій смузі. 9. Площа поверхні та середня відстань частинок можуть впливати на реологію рідини. 10. У посібнику детально описані різні робочі конфігурації використання тих чи інших інтерфейсів дискової підсистеми.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

We move ... the wild and exciting world ... high-speed flow. To jump ... this world, however, we need some preparation. This information prepares us to deal with the high-speed subsonic, transonic, supersonic, and hypersonic flows that must be discussed. Here we once again add ... our inventory of fundamental principles and relations – those necessary to understand and predict high-speed flow.

Energy? What do we mean? Consider that you are ... an automobile traveling ... 65 miles per hour along a highway. If you stick your hand ... the window (not recommended ... the way, for safety reasons) you will sense a certain amount ... energy ... the airflow, and your hand will be forced back ... some extent.

Now imagine that you are traveling ... 650 mi/h and you stick your hand ... the window (figuratively). You can just imagine what tremendous energy you would sense, and what disaster would happen ... your hand. The point is that high-speed flow is high-energy flow. The science ... energy is thermodynamics. So, this chapter is, ... the most part, a discussion ... thermodynamics – but only ... the extent necessary ... our subsequent applications ... high-speed flow. High-speed flow is also compressible flow.

6. Translate the text from task 1 into Ukrainian.

Workshop 8

1. Read the text carefully before doing the tasks below

Specific Problems Detecting Network Attacks. Turning now to the specific problem of detecting network intrusion, the problem is much harder than (say) detecting mobile phone cloning for a number of reasons. Network intrusion detection products still don't work very well, with both high missed alarm and false alarm rates. It's common not to detect actual intrusions until afterwards – although once one is detected by other means, the traces can be found on the logs. The reasons for the poor performance include the following, in no particular order.

The Internet is a very noisy environment – not just at the level of content but also at the packet level. A large amount of random crud arrives at any

substantial site, and enough of it can be interpreted as hostile to provide a significant false alarm rate. A survey by Bellovin reports that many bad packets result from software bugs; others are the fault of out-of-date or corrupt DNS data; and some are local packets that escaped, travelled the world and returned. There are ‘too few attacks’. If there are ten real attacks per million sessions – which is almost certainly an overestimate – then even if the system has a false alarm rate as low as 0.1%, the ratio of false to real alarms will be 100. We talked about similar problems with burglar alarms; it’s also a well-known problem for medics running screening programs for diseases like HIV where the test error exceeds the organism’s prevalence. In general, where the signal is far below the noise, the guards get tired and even the genuine alarms get missed. Many network attacks are specific to particular versions of software, so a general misuse detection tool must have a large and constantly changing library of attack signatures.

In many cases, commercial organisations appear to buy intrusion detection systems simply in order to tick a ‘due diligence’ box to satisfy insurers or consultants. That means the products aren’t always kept up to date. Encrypted traffic can’t easily be subjected to content analysis any more than it can be filtered for malicious code. The issues we discussed in the context of firewalls largely apply to intrusion detection too. You can filter at the packet layer, which is fast but can be defeated by packet fragmentation; or you can reconstruct each session, which takes more computation and so is not really suitable for network backbones; or you can examine application data, which is more expensive still – and needs to be constantly updated to cope with the arrival of new applications and attacks.

You may have to do intrusion detection both locally and globally. The antivirus side of things may have to be done on local machines, especially if the malware arrives on encrypted web sessions; on the other hand, some attacks are stealthy – the opponent sends 1-2 packets per day to each of maybe 100,000 hosts. Such attacks are unlikely to be found by local monitoring; you need a central monitor that keeps histograms of packets by source and destination address and by port. So, it appears unlikely that a single-product solution will do the trick. Future intrusion detection systems are likely to involve the coordination of a number of monitoring mechanisms at different levels both in the network (backbone, LAN, individual machine) and in the protocol stack (packet, session and application).

2. Find the English equivalents in the text and commit them to memory

| | | |
|---|-----------------------|--|
| 1 | атака мережі | |
| 2 | частота тривоги | |
| 3 | погана продуктивність | |
| 4 | шумне середовище | |

| | | |
|----|---|--|
| 5 | програмне забезпечення | |
| 6 | певна версія | |
| 7 | зашифрований трафік | |
| 8 | потребувати постійного оновлення | |
| 9 | завищена оцінка | |
| 10 | інструмент щодо виявлення неправильного використання | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a network intrusion, a specific problem, a number of reasons, a significant rate, a false alarm, genuine alarms, to satisfy, both locally and globally, local machines, a central monitor

1. In addition, you can install up to five compatible DS monitors throughout the house, to which the ... WiFi ... connects directly and wirelessly. 2. You can see that they have achieved 3. Our professional lawyers appreciate every customer, so always happy to develop custom solutions to a 4. Software runs on your No internet or complex cloud networks required. 5. That was ... but scientists have been monitoring the volcano closely ever since. 5. Its earlier attempt to seize Kuwait had, however, caused ... since it might then have emerged as a larger petroleum producer than Saudi Arabia itself, as well as a more substantial military power. 7. Our policy is ... our customers. 8. A fundamental threat to justice and peace – ... – is the global economic crisis. 9. Experts name ... for an increase in prices for the traditional Ukrainian product. 10. In particular, in the context of violations and ... detection, the interesting objects are often not rare, but unexpected bursts in activity.

4. Translate the following sentences into English using the words and word combinations below

a destination address, a single-product, at different levels, in the network, to be not really suitable for, a general misuse, a substantial site, a number of reasons, a large amount of, to be interpreted as

1. Людський організм має великий арсенал антиоксидантних механізмів, які діють на різних рівнях. 2. Важко сказати, скільки саме блогів існує у мережі на сьогодні. 3. Однак, якщо вийти за рамки окремого товару і розглядати додаткові послуги або рішення, які працюють на перспективу, тут вартість може відійти на другий план. 4. Така інформація жодним чином не може трактуватися як консультація. 5. Під час події вивергнулась велика кількість вулканічного попелу, що повністю вкрив навколишні райони. 6. Втрата важливих даних може відбутися не тільки через шкідливе програмне забезпечення, але й через перебої в електриці, відмови

обладнання і неправильне використання. 7. Від самовпевненості до ясності цілей існує цілий ряд причин, який віддаляє вас від успіху. 8. Ще одна категорія – професіонали, які працюють у корпораціях як високооплачувані консультанти або пишуть тексти для сайтів з великим трафіком. 9. Спосіб дійсно результативний, але він дуже тривалий і виснажливий, а тому не підходить для частого застосування. 10. Редактор електронної пошти зберігає адресу призначення.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

Preventing and detecting attacks that are launched ... networks, and particularly ... the Internet, is probably the most newsworthy aspect ... security engineering. The problem is unlikely to be solved any time soon, ... many different kinds ... vulnerability contribute to the attacker's toolkit. Ideally, people would run carefully written code on trustworthy platforms. ... real life, this won't happen always, or even often. ... the corporate world, there are grounds ... hope that firewalls can keep ... the worst ... the attacks, careful configuration management can block most ... the rest, and intrusion detection can catch most ... the residue that make it through. Home users are less well placed, and most ... the machines being recruited to the vast botnets we see ... action today are home machines attached to DSL or cable modems. Hacking techniques depend partly ... the opportunistic exploitation ... vulnerabilities introduced accidentally ... the major vendors, and partly ... techniques to social-engineer people ... running untrustworthy code. Most ... the bad things that result are just the same bad things that happened a generation ago, but moved online, ... a larger scale, and ... a speed, level of automation and global dispersion that leaves law enforcement wrong-footed. Despite all this, the Internet is not a disaster. It has brought huge benefits ... billions of people, and levels ... online crime are well below the levels ... real-world crime.

6. Translate the text from task 1 into Ukrainian.

Workshop 9

1. Read the text carefully before doing the tasks below

A nuclear detonation results from the formation of a supercritical mass of fissile material, with a near instantaneous release of nuclear binding energies and large-scale conversion of mass to energy. Fission is the process where a heavier unstable nucleus divides or splits into two or more lighter nuclei, and, with certain materials, substantial amounts of energy are released. The materials used to produce nuclear explosions are the readily fissile isotopes of uranium or

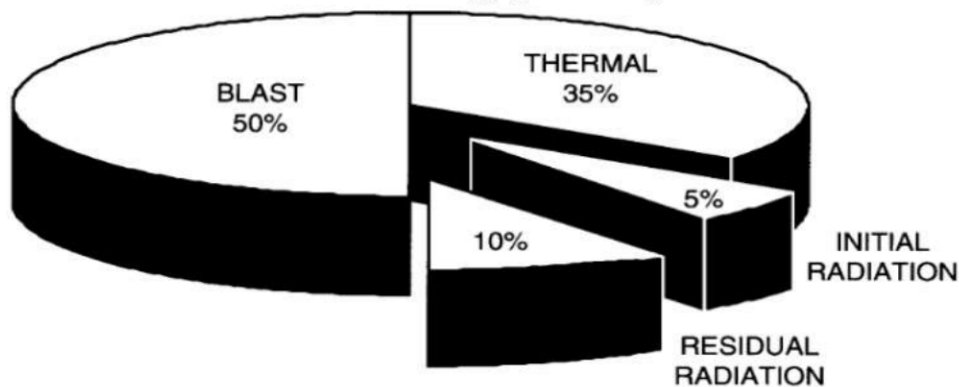
plutonium: Uranium-235 and Plutonium-239. Modern weapons may boost their yield by incorporating a fusion element, which may be regarded as the opposite of fission. It is the combining of two light nuclei to form a heavier nucleus (thermonuclear reaction). The only practical way to obtain the temperatures and pressures required for fusion is by means of a fission explosion. Consequently, weapons with fusion components contain a basic fission component.

a. Basic Detonation Characteristics. The destructive action of conventional explosions is almost entirely due to the transmission of energy in the form of a blast wave and the resultant projectiles (shrapnel). The energy of a nuclear explosion is transferred to the environment in three distinct forms—blast, thermal radiation, and nuclear radiation. The energy distribution among these three forms will depend on the weapon yield, the location of the burst, and the characteristics of the environment. The energy from a low altitude atmospheric detonation of a moderate-sized weapon in the KT range is distributed roughly as follows (Figure 1):

Fifty percent as blast. Thirty-five percent of thermal radiation is made up of a wide range of electromagnetic spectrum including infrared, visible, and ultraviolet light and some soft x-rays.

Figure 1

Energy partition from a nuclear detonation



Fifteen percent as ionizing radiation, including 5 percent as initial (or prompt) radiation emitted within the first minute after detonation, consisting chiefly of neutrons and gamma rays, and 10 percent as residual nuclear radiation (fallout). It should be noted that the distribution of energy is significantly altered in an enhanced radiation nuclear weapon (neutron bomb). A neutron bomb is designed specifically to reduce the energy that is dissipated as blast and heat and increase the amount of initial nuclear radiation. Its approximate energy distribution is 30 percent blast, 20 percent thermal, 45 percent initial radiation, and 5 percent residual radiation.

b. Types of Bursts. The altitude at which the weapon is detonated will largely determine the relative effects of blast, heat, and nuclear radiation. Nuclear explosions are generally classified as airbursts, surface bursts, subsurface bursts, or high-altitude bursts.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--|--|
| 1 | ядерний вибух | |
| 2 | надкритична маса матеріалу, що розщеплюється | |
| 3 | миттєве вивільнення | |
| 4 | нестабільне ядро | |
| 5 | значна кількість енергії | |
| 6 | термоядерна реакція | |
| 7 | низька висота | |
| 8 | теплове випромінювання | |
| 9 | інфрачервоне світло | |
| 10 | нейтронна бомба | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

formation of, mass and energy, to divide and split into, to produce nuclear explosions, a fusion element, a practical way to, a basic component, characteristics of the environment, an electromagnetic spectrum, after detonation

1. Despite the agreement on a two-way cease-fire, a helicopter was fired by terrorists from a portable air defense missile complex, fell to the ground and, ... of ammunition, burned. 2. Relative humidity is one of the most important 3. The transformation of the peculiarities of their activity contributed to ... state building processes which caused fundamental changes in the society. 4. Ukraine is able ... weapons and manage them. 5. We will not accept a policy that ... Ukraine, or that seeks to spread the action taken in Crimea to the East of Ukraine or other Eastern European partner countries. 6. It helps audiences understand how and why astronomers use multiple regions of ... to explore and learn about our universe. 7. Stars generate energy by the nuclear 8. The wind turbine is an essential element and ... of the windmill's operation. 9. All atoms of the Earth transfer their ... the Earth monad in the same way we transfer our money to a financial bank. 10. There is no ... protect yourself from all the toxins in the environment.

4. Translate the following sentences into English using the words and word combinations below

a nuclear binding energy, a large-scale conversion of, more lighter nuclei, with certain materials, a location of, to reduce the energy, a nuclear radiation, a blast and heat, the energy distribution, modern weapons

1. Більшість інженерів-хіміків отримують зайнятість у галузях, де відбувається масштабне перетворення сировини. 2. Енергія взаємодії

атомів залежить від відстані між ядрами. 3. Цей рух дозволить отримати більше інформації про розподіл енергії світла та основне фізичне явище, що виникає на відстані багатьох світових років від Землі. 4. Ядерна війна також призведе до різних ефектів дальньої дії, які виходять за межі вибуху та нагрівання. 5. Чорнобиль, просочений шкідливою ядерною радіацією, був відрізаний від решти світу на десятиліття. 6. Тим самим ЄС і США хочуть зменшити енергетичну залежність колишніх держав Варшавського договору від поставок російського газу. 7. У другій частині параду були показані реальні тактичні дії розвідувально-бойових підрозділів з бойовим застосуванням сучасного озброєння і військової техніки. 8. Будьте обережні з певними продуктами. 9. Топографічний план може і не охоплювати такі відомості, як розташування комунікаційних ліній. 10. Зірка генерує більш важкі елементи, об'єднуючи більш легкі ядра водню, гелію, дейтерію, берилію, літію та бору, котрі були у складі міжзоряного середовища, і, як наслідок, у зірках.

5. Read the extracts below and match the types of bursts and their descriptions

A surface burst / A high altitude burst / An airburst / A subsurface burst

(1) ... is an explosion in which a weapon is detonated in air at an altitude of sufficient height that the fireball does not contact the surface of the earth. The altitude can be varied to obtain maximum blast effects, maximum thermal effects, desired radiation effects, or a balanced combination of these effects. Burns to exposed skin may be produced over many square kilometers and eye injuries over a still larger area. Initial nuclear radiation will be a significant hazard with smaller weapons, but the fallout hazard can be ignored. The fission products are generally dispersed over a very large area unless there is local rainfall, which would result in a more localized fallout pattern.

(2) ... is an explosion in which a weapon is detonated on or slightly above, the surface of the earth so that the fireball actually touches the land or water surface. Under these conditions, the area affected by the blast, thermal radiation, and initial nuclear radiation will be less than that for an airburst of similar yield, except in the region of ground zero where destruction is concentrated. In contrast with airbursts, local fallout can be a hazard over a much larger downwind area than that affected by blast and thermal radiation.

(3) ... is an explosion in which the point of the detonation is beneath the surface of the land or water. Cratering will generally result from an underground burst, just as for a surface burst. If the burst does not penetrate the surface, the only other hazard will be from ground or water shock. If the burst is shallow enough to penetrate the surface, blast, thermal, and initial nuclear radiation effects will be present, but will be less than for a surface burst of comparable yield. Local fallout will be very heavy if surface penetration occurs.

(4) ... is one in which the weapon is exploded at a high altitude (typically above 50 km) so that it generates an intense electromagnetic pulse (EMP) which can significantly degrade the performance of, or destroy sophisticated electronic equipment. Significant ionization of the upper atmosphere (ionosphere) can occur and this radiation can travel for hundreds of miles before being absorbed. For example, a high altitude burst of strategic weapons could be employed with the intent of causing severe disruption or destruction of national command, control, communications, computers, and intelligence systems. There are no known adverse biological effects of EMP at exposure levels below the established protection standards.

6. Translate the text from task 1 into Ukrainian.

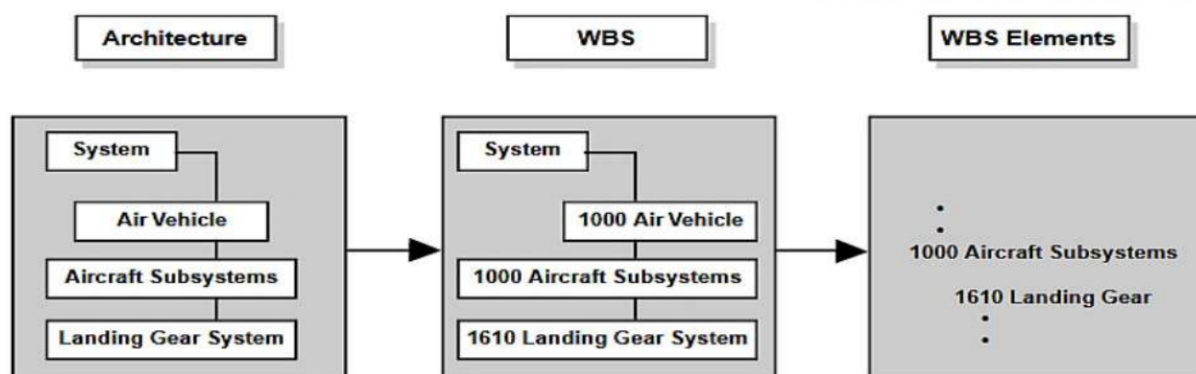
Workshop 10

1. Read the text carefully before doing the tasks below

The Work Breakdown Structure (WBS) is a means of organizing system development activities based on system and product decompositions. The systems engineering process described in earlier chapters produces system and product descriptions. These product architectures, together with associated services (e.g., program management, systems engineering, etc.) are organized and depicted in a hierarchical tree-like structure that is the WBS (Figure 1).

Because the WBS is a direct derivative of the physical and systems architectures it could be considered an output of the systems engineering process. It is being presented here as a Systems Analysis and Control tool because of its essential utility for all aspects of the systems engineering process. It is used to structure development activities, to identify data and documents, and to organize integrated teams, and for other non-technical program management purposes.

*Figure 1
Architecture to WBS Flow*



WBS Role in the Department of Defense (DoD) Systems Engineering. DoD 5000.2-R requires that a program WBS be established to provide a framework for program and technical planning, cost estimating, resource allocation, performance measurement, and status reporting. The WBS is used to define the total system, to display it as a product-oriented family tree composed of hardware, software, services, data, and facilities, and to relate these elements to each other and to the end product.

The program WBS is developed initially to define the top three levels. As the program proceeds through development and is further defined, program managers should ensure that the WBS is extended to identify all high-cost and high-risk elements for management and reporting, while ensuring the contractor has complete flexibility to extend the WBS below the reporting requirement to reflect how work will be accomplished.

Basic Purposes of the WBS

Organizational: The WBS provides a coordinated, complete, and comprehensive view of program management. It establishes a structure for organizing system development activities, including IPT design, development, and maintenance.

Business: It provides a structure for budgets and cost estimates. It is used to organize collection and analysis of detailed costs for earned value reports (Cost Performance Reports or Cost/Schedule Control System Criteria reporting).

Technical: The WBS establishes a structure for:

- Identifying products, processes, and data,
- Organizing risk management analysis and tracking,
- Enabling configuration and data management.

It helps establish interface identification and control.

- Developing work packages for work orders and material/part ordering, and
- Organizing technical reviews and audits.

The WBS is used to group product items for specification development, to develop Statements of Work (SOW), and to identify specific contract deliverables.

WBS – Benefits. The WBS allows the total system to be described through a logical breakout of product elements into work packages. A WBS, correctly prepared, will account for all program activity. It links program objectives and activities with resources, facilitates initial budgets, and simplifies subsequent cost reporting. The WBS allows comparison of various independent metrics and other data to look for comprehensive trends.

It is a foundation for all program activities, including program and technical planning, event schedule definition, configuration management, risk management, data management, specification preparation, SOW preparation, status reporting and problem analysis, cost estimates, and budget formulation.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--|--|
| 1 | процес проектування систем | |
| 2 | разом із пов'язаними службами | |
| 3 | ієрархічна деревоподібна структура | |
| 4 | прямий похідний від чогось | |
| 5 | інструмент системного аналізу та керування | |
| 6 | для ідентифікації даних і документів | |
| 7 | управління програмами | |
| 8 | комплексне уявлення | |
| 9 | створювати структуру для чогось | |
| 10 | технічний огляд та аудит | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a decomposition, an engineering process, depicted in, an output of, to be considered, for all aspects of, the high-risk of, a data management, a comprehensive trend, a risk management

1. Kingston's ... includes the testing of each new module design in the system in which it will ultimately be used. 2. Whoever will remain will ... terrorists. 3. Vendors are responsible ... order processing, fulfillment and customer service. 4. Explain the physical effects ... the photo/video. 5. The latter has ... 136 horsepower. 6. Likely to follow stricter regulation and international ... measures. 7. The process of installation is dangerous for installers: ... injury in the course of manipulating a protective spherical element during its attachment to the fastener. 8. Caring for yourself becomes ... that affects literally all areas of the body and soul. 9. The actual process of death and ... is censored. 10. The tutorial is intended for readers, who have a basic understanding of job management and ... in a mainframe environment.

4. Translate the following sentences into English using the words and word combinations below

a problem analysis, cost estimates, a budget formulation, to identify specific groups, specification for development, a total system, development activities, a performance measurement, to structure, product descriptions

1. Експерти представили попередні оцінки вартості, а також ризиків будівництва залізничного мосту. 2. Раніше в холдингу «Термодинаміка», що займається розробкою нової парашутної системи, заявили про припинення робіт з причини зміни технічного завдання на розробку. 3. Але як ми розробляємо ефективні системи вимірювання продуктивності і, що

більш важливо, як ми використовуємо їх для сталого результату? 4. Список має включати опис продукції, результати маркетингових досліджень, форму підприємства, можливі ризики та шляхи виходу зі скрутних ситуацій. 5. Методологія ґрунтується на формулюванні бюджетів репрезентативних видів діяльності. 6. Використовуйте цю інформацію, щоб визначити нішу для свого бізнесу. 7. Вони мають досвід проведення заходів з розвитку експорту. 8. Але бувають ситуації, коли складно визначити конкретні групи цільової аудиторії. 9. Важливо розрізняти аналіз проблем і прийняття рішень. 10. Колективна дія таких компонентів визначає функціонування всієї системи.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

We use computers to do simulations because they are:

1. cheaper;
2. faster;
3. often better;
4. can do what you cannot do ... the lab.

On points 1 and 2, as expensive and slow ... programming is, with all its errors and other faults, it is generally much cheaper and faster than getting laboratory equipment to work. Furthermore, ... recent years expensive, top quality laboratory equipment has been purchased and then you often find in less ... 10 years it must be scrapped ... being obsolete. All of the ... remarks do not apply when a situation is constantly recurring and the lab testing equipment is in constant use. But let lab equipment lie idle ... some time, and suddenly it will not work properly! This is called “shelf life”, but it is sometimes the “shelf life” ... the skills in using it rather ... the “shelf life” ... the equipment itself! I have seen it all too often in my direct experience. Intellectual shelf life is often more insidious ... is physical shelf life.

On point 3, very often we can get more accurate readings ... a simulation than we can get from a direct measurement in the real world. Field measurements, or even laboratory measurements, are often hard to get accurately ... dynamic situations. Furthermore, ... a simulation we can often run over much wider ranges ... the independent variables than we can do ... any one lab setup.

On point 4, perhaps most important of all, a simulation can do what no experiment can do. I will illustrate these points ... specific stories using simulations I have been involved ... so you can understand what simulations can do ... you. I will also indicate some ... the details so those who have had only a little experience ... simulations will have a better feeling ... how you go about doing one – it is not feasible to actually carry ... a big simulation in class, they often take years ... complete.

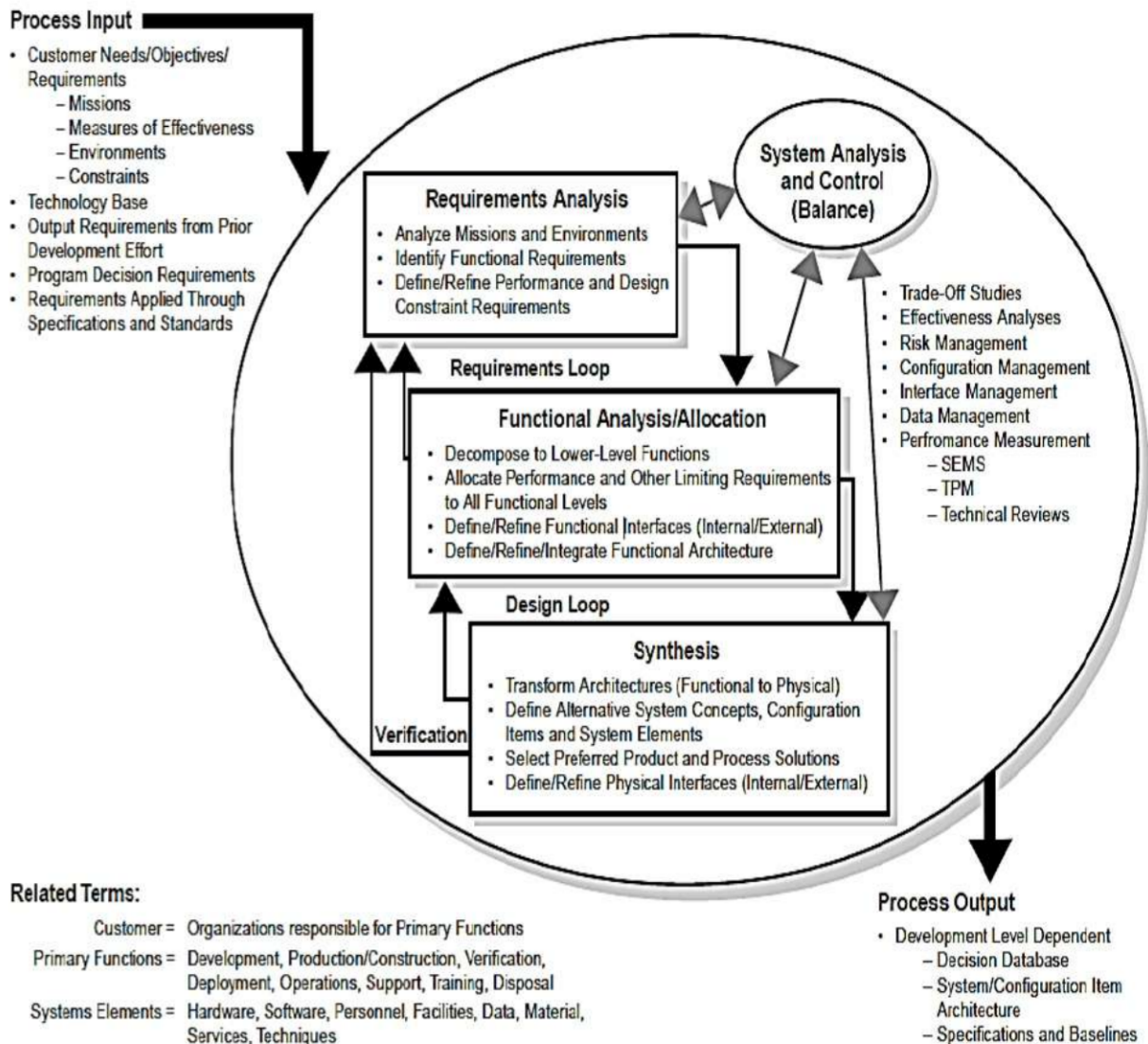
6. Translate the text from task 1 into Ukrainian.

Workshop 11

1. Read the text carefully before doing the tasks below

The Systems Engineering Process (SEP) is a comprehensive, iterative, and recursive problem-solving process, applied sequentially top-down by integrated teams. It transforms needs and requirements into a set of system product and process descriptions, generates information for decision-makers, and provides input for the next level of development. The process is applied sequentially, one level at a time, adding additional detail and definition with each level of development. As shown by Figure 1, the process includes: inputs and outputs; requirements analysis; functional analysis and allocation; requirements loop; synthesis; design loop; verification; and system analysis and control.

Figure 1
The Systems Engineering Process



Systems Engineering Process Inputs

Inputs consist primarily of the customer's needs, objectives, requirements, and project constraints. Inputs can include, but are not restricted to, missions, measures of effectiveness, environments, available technology base, output requirements from the prior application of the systems engineering process, program decision requirements, and requirements based on "corporate knowledge."

Requirements Analysis

The first step of the Systems Engineering Process is to analyze the process inputs. Requirements analysis is used to develop functional and performance requirements; that is, customer requirements are translated into a set of requirements that define what the system must do and how well it must perform. The systems engineer must ensure that the requirements are understandable, unambiguous, comprehensive, complete, and concise. Requirements analysis must clarify and define functional requirements and design constraints.

Functional requirements define quantity (how many), quality (how good), coverage (how far), timelines (when and how long), and availability (how often). Design constraints define those factors that limit design flexibility, such as: environmental conditions or limits; defense against internal or external threats; and contract, customer or regulatory standards.

Functional Analysis/Allocation

Functions are analyzed by decomposing higher-level functions identified through requirements analysis into lower-level functions. The performance requirements associated with the higher level are allocated to lower functions. The result is a description of the product or item in terms of what it does logically and in terms of the performance required. This description is often called the functional architecture of the product or item. Functional analysis and allocation allow for a better understanding of what the system has to do, in what ways it can do it, and to some extent, the priorities and conflicts associated with lower-level functions. It provides information essential to optimizing physical solutions. Key tools in functional analysis and allocation are Functional Flow Block Diagrams, Time Line Analysis, and the Requirements Allocation Sheet.

Requirements Loop

Performance of the functional analysis and allocation results in a better understanding of the requirements and should prompt reconsideration of the requirements analysis. Each function identified should be traceable back to a requirement. This iterative process of revisiting requirements analysis as a result of functional analysis and allocation is referred to as the requirements loop.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|----------------------------------|--|
| 1 | повторюваний | |
| 2 | процес вирішення проблеми | |
| 3 | особа, яка приймає рішення | |
| 4 | перевірка | |
| 5 | корпоративні знання | |
| 6 | однозначний | |
| 7 | гнучкість | |
| 8 | розкладання функцій вищого рівня | |
| 9 | лист розподілу вимог | |
| 10 | простежуваний | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

environmental conditions, loop design, requirements analysis, functional analysis, an engineering process system, effectiveness, reconsideration, inputs and outputs, external threats, an iterative process

1. Systems engineering uses a host of tools that include modelling and simulation, ... and scheduling to manage complexity. 2. As for everything else, it also has all the necessary ... for connecting other equipment. 3. Areas of research: geophysical exploration of wells, numerical methods, 4. A reverse ... for repairing gears and gearboxes it was described. 5. They never have learned that insights become ... only through hard systematic work. 6. However, if the ... are very unfavorable, they just hibernate. 7. US companies are prohibited from working with the Chinese corporation to protect their infrastructure from possible 8. Toe ... keeps protector in place. 9. Upon receipt of the updated article, the Executive Editor submits it to repeated peer review, and then on ... by the Editorial Board. 10. This is essentially an optimization problem which has to be solved in an

4. Translate the following sentences into English using the words and word combinations below

a block diagram, simulation, a decision-maker, optimization, flowing, modelling, allocation, Internet infrastructure, problem-solving, an unambiguous answer

1. Просто переконайтеся, що кожен, хто приймає рішення, завжди володіє необхідною інформацією. 2. Зараз оптимізація сайту під середньочастотні запити – найбільш популярне рішення. 3. Ефективне управління будь-яким процесом вимагає кількісного визначення, вимірювання та моделювання. 4. Досліджуйте сонячну систему за допомогою цієї заворожуюче красивої і точної симуляції у режимі реального часу. 5. Розподіл відсотків не може

бути точним. 6. Науковці досліджують процес мислення людини, зокрема такі речі як прийняття рішень чи вирішення проблем. 7. Три речі, які Україні варто було б розвивати, – інтернет-інфраструктура, логістика та електронні платежі. 8. Блок-схема – це спосіб представлення алгоритму у вигляді наочної графічної схеми. 9. Два передсердя (верхні камери) збирають кров, що тече у напрямку до серця. 10. На його думку, немає короткої та однозначної відповіді на це питання.

5. Read the paragraphs below and choose the titles for each one

Systems Analysis and Control / Verification / Design Synthesis / Design Loop

(1) Design synthesis is the process of defining the product or item in terms of the physical and software elements which together make up and define the item. The result is often referred to as the physical architecture. Each part must meet at least one functional requirement, and any part may support many functions. The physical architecture is the basic structure for generating the specifications and baselines.

(2) Similar to the requirements loop described above, the design loop is the process of revisiting the functional architecture to verify that the physical design synthesized can perform the required functions at required levels of performance. The design loop permits reconsideration of how the system will perform its mission, and this helps optimize the synthesized design.

(3) For each application of the system engineering process, the solution will be compared to the requirements. This part of the process is called the verification loop, or more commonly, verification. Each requirement at each level of development must be verifiable. Baseline documentation developed during the systems engineering process must establish the method of verification for each requirement. Appropriate methods of verification include examination, demonstration, analysis (including modelling and simulation), and testing. Formal test and evaluation (both developmental and operational) are important contributors to the verification of systems.

(4) Systems Analysis and Control include technical management activities required to measure progress, evaluate and select alternatives, and document data and decisions. These activities apply to all steps of the systems engineering process. System analysis activities include trade-off studies, effectiveness analyses, and design analyses. They evaluate alternative approaches to satisfy technical requirements and program objectives, and provide a rigorous quantitative basis for selecting performance, functional, and design requirements. Tools used to provide input to analysis activities include modelling, simulation, experimentation, and test.

6. Translate the text from task 1 into Ukrainian.

Workshop 12

1. Read the text carefully before doing the tasks below

Airlines. Among the diverse elements that conform the air transportation industry, airlines represent the most visible ones and the most interactive with the consumer, i.e., the passenger. An airline provides air transport services for travelling passengers and/or freight. Airlines lease or own their aircraft with which to supply these services and may form partnerships or alliances with other airlines for mutual benefit, e.g., *Oneworld*, *Skyteam*, and *Star alliance*. Airlines vary from those with a single aircraft carrying mail or cargo, through full-service international airlines operating hundreds of aircraft. Airline services can be categorized as being intercontinental, intra-continental, domestic, regional, or international, and may be operated as scheduled services or charters.

The first airlines were based on dirigibles. DELAG (Deutsche Luftschiffahrts-Aktiengesellschaft) was the world's first airline. It was founded on November 16, 1909, and operated airships manufactured by the zeppelin corporation. The four oldest non-dirigible airlines that still exist are Netherlands' KLM, Colombia's Avianca, Australia's Qantas, and the Czech Republic's Czech Airlines. From those first years, going on to the elite passenger of the fifties and ultimately to the current mass use of air transport, the world airline companies have evolved significantly.

Traditional airlines were state-owned. They were called *flag companies* and used to have a strong strategic influence. It was not until 1978, with the United States Deregulation Act, when the market started to be liberalized. The main purpose of the act was to remove government control over fares, routes, and market entry of new airlines in the commercial aviation sector. Up on that law, private companies started to emerge in the 80's and 90's, especially in USA. Very recently, new phenomena have arisen within the last 10–15 years: the so-called *low-cost companies*, which have favoured the mass transportation of people.

Military air forces. The military air forces are linked to the defence of each country. In that sense, they play a strategic role in security, heavily depending on the economic potential of the country and its geopolitical situation. Historically, it has been an encouraging sector for technology and innovation towards military supremacy. Think for instance in the advances due to World War II and the Cold War. Nowadays, it is mostly based on cooperation and alliances. However, inherent threats in nations still make this sector a strategic sector whose demand in high technology will be maintained. An instance of this is the encouraging trend of the USA towards the development of Unmanned Air Vehicles (UAV) in the last 20 years in order to maintain the supremacy in the Middle East minimizing the risk of soldier's life.

Aerospace research institutions. The research institutions fulfil a key role within the aerospace activities because the development of aviation and space missions is based on a continuous technological progress affecting a variety of disciplines such as aerodynamics, propulsion, materials, avionics, communication, airports, air navigation, etc. The research activity is fundamentally fulfilled at universities, aerospace companies, and public institutions. Spain counts with the Instituto Nacional de Técnica Aeroespacial (INTA), which is the Spanish public research organization, specialized in aerospace research and technology development. It pursues the acquisition, maintenance, and continuous improvement of all those technologies that can be applied to the aerospace field. There exist ‘sister’ institutions such the French Aerospace Lab (ONERA), the German Aerospace Center (DLR), or the National Aeronautics and Space Administration (NASA) in the United States of America (USA), just to mention a few significant ones.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|-------------------------------|--|
| 1 | транспортна галузь | |
| 2 | оренда | |
| 3 | планова послуга (рейс) | |
| 4 | у державній власності | |
| 5 | флагманська компанія | |
| 6 | комерційна авіація | |
| 7 | компанія з низькими цінами | |
| 8 | військова перевага | |
| 9 | авіаційно-космічна діяльність | |
| 10 | рушійна сила | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a mutual benefit, a combat, government control, aerospace companies, fares, air transport services, technology and innovation, optical communication lines, a strong strategic alliance, maintenance

1. During the first five months of ..., the island’s aircraft destroyed or damaged about thirty-seven Italian aircraft. 2. Judges decide cases according to their own judgement, without outside influence or 3. The application of different ... when issuing flight tickets allows reducing the total cost of the flight. 4. No attention is paid to them, neither by aviation industry nor by air carriers, does this not favour the development of aircraft construction and the expansion of 5. Boilers are fully automatic, requiring much less time on ... and personnel costs, respectively. 6. Besides ..., we pay more attention to environmental protection. 7. Currently, the US nuclear weapons are operating in ... with the

forces of countries such as France and Britain. 8. The application of Li-ion batteries evokes also increasing interest from the military and 9. Continuity and development of relations is ensured on the basis of ... and respect. 10. ... virtually unaffected by external factors, leading to deterioration of communication quality.

4. Translate the following sentences into English using the words and word combinations below

a wheel of technological progress, flight tickets, a dirigible, aerodynamics, intercontinental flights, nuclear weapons, a geopolitical situation, economic potential, Li-ion batteries, a consumer

1. Морський офіцер розробив потужний двигун для дирижабля. 2. Більша частина респондентів вважає, що ядерна зброя має бути заборонена. 3. Крім того, це головний вузол для взаємозв'язків всередині Європи та для міжконтинентальних рейсів. 4. Поряд з нашими кордонами змінилася геополітична ситуація, ми зрозуміли, що загроза дуже реальна. 5. Літій-іонні акумулятори завжди заряджені та готові до використання у різних режимах. 6. Ми націлені на перспективу та передбачаємо потреби споживачів, щоб успішно впроваджувати інноваційні продукти високої якості. 7. Колесо технологічного прогресу постійно нарощує оберти, надаючи дедалі більше можливостей людству. 8. Вартість авіаквитків складається із тарифів, податків та зборів, встановлених перевізниками та аеропортами. 9. Група Світового банку допоможе уряду України подолати обмеження, які заважають країні повністю розкрити свій економічний потенціал. 10. Основу млинарства становлять механіка, аеродинаміка і біохімія – науки не нові і усталені.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

In order to promote reliable, efficient, and safe air transportation, many regulations are needed. This regulatory framework arises individually in each country but always under the regulatory core ... two fundamental supranational organizations: The International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA).

ICAO was created as a result of the Chicago Convention. ICAO was created as a specialized agency of the United Nations charged ... coordinating and regulating international air travel. The Convention establishes rules ... airspace, aircraft registration and safety, and details the rights of the signatories in relation ... air travel. In the successive revisions, ICAO has agreed certain criteria about the freedom ... overflying and landing ... countries, to develop the safe and ordered development ... civil aviation worldwide, to encourage the design and use

techniques of airships, to stimulate the development of the necessary infrastructures ... air navigation. Overall, ICAO has encouraged the evolution of civil aviation.

The modern IATA is the successor ... the International Air Traffic Association founded in The Hague in 1919. IATA was founded in Havana, Cuba, in April 1945. It is the prime vehicle ... inter-airline cooperation in promoting safe, reliable, secure, and economical air services. IATA seeks to improve understanding ... the industry among decision-makers and increase awareness of the benefits that aviation brings ... national and global economies. IATA ensures that people and goods can move ... the global airline network as easily as if they were ... a single airline in a single country.

In addition ... the cited organizations, it is convenient to mention the two most important organizations ... responsibility in safety laws and regulations, including the airship project and airship certification, maintenance labour, crew training, etc.: The European Aviation Safety Agency (EASA) in the European Union and the Federal Aviation Administration (FAA). Spain counts with the Agencia Estatal de Seguridad Aérea (AESA), dependent ... the ministry of infrastructures. AESA is also responsible ... safety legislation in civil aviation, airships, airports, air navigation, passengers' rights, general aviation, etc.

6. Translate the text from task 1 into Ukrainian.

Workshop 13

1. Read the text carefully before doing the tasks below

The main groups of materials used in aircraft construction nowadays are steel, aluminum alloys, titanium alloys, and fibre-reinforced composites.

Titanium alloys possess high specific properties, have good fatigue strength/tensile strength ratio with a high fatigue limit, and some retain considerable strength at temperatures up to 400–500°C. Generally, there is also good resistance to corrosion and corrosion fatigue although properties are adversely affected by exposure to temperature and stress in a salty environment. The latter poses particular problems in the engines of carrier-operated aircraft. Further disadvantages are a relatively high density so that weight penalties are imposed if the alloy is extensively used, coupled with high costs (of the material itself and due to its fabrication), approximately seven times those of aluminum and steel. Therefore, due to its very particular characteristics (good fatigue strength/tensile strength at very high temperatures), titanium alloys are typically used in the most demanding elements of jet engines, e.g., the turbine blades.

Steels result from alloying Iron (Fe) with Carbon (C). Steels were the materials of the primary and secondary structural elements in the 30s. However, they were substituted by aluminum alloys. Its high specific density prevents its

widespread use in aircraft construction, but it has retained some value as a material for castings of small components demanding high tensile strengths, high stiffness, and high resistance to damage. Such components include landing gear pivot brackets, wing-root attachments, and fasteners.

If one thinks of pure *aluminum*, the first thought is that it has virtually no structural application. It has a relatively low strength and it is extremely flexible. Nevertheless, when alloyed with other metals its mechanical properties are improved significantly, preserving its low specific weight (a key factor for the aviation industry). The typical alloying elements are copper, magnesium, manganese, silicon, zinc, and lithium. Aluminum alloys substituted steel as primary and secondary structural elements of the aircraft after World War II and thereafter. Four groups of aluminum alloy have been used in the aircraft industry for many years and still play a major role in aircraft construction: Al-Cu (2000 series); Al-Mg (5000 series); Al-Mg-Si (6000 series); Al-Zn-Mg (7000 series). The latest aluminum alloys to find general use in the aerospace industry are the aluminum-lithium (Al-Li, 8000 series) alloys.

Composite materials are materials made from two or more constituent materials with significantly different physical or chemical properties, that when combined produce a material with characteristics different from the individual components. In particular, the aircraft manufacturing industry uses the so-called fibre-reinforced composite materials, which consist of strong fibres such as glass or carbon set in a matrix of plastic or epoxy resin, which is mechanically and chemically protective.

A sheet of fibre-reinforced material is anisotropic, i.e., its properties depend on the direction of the fibres working at traction-compression. Therefore, in structural form, two or more sheets are sandwiched together to form a lay-up so that the fibre directions match those of the major loads. This lay-up is embedded into a matrix of plastic or epoxy resin that fits things together and provides structural integrity to support both bending and shear stresses.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|-----------------------------|--|
| 1 | титановий сплав | |
| 2 | властивості | |
| 3 | межа втоми | |
| 4 | шляхом витримки | |
| 5 | лопаті турбіни | |
| 6 | цільність | |
| 7 | кронштейн шасі | |
| 8 | композитні матеріали | |
| 9 | літакобудівна промисловість | |
| 10 | анізотропний | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

high tensile strength, structural integrity, aluminum alloys, physical or chemical properties, corrosion resistance, aircraft construction, fibre-reinforced, extremely flexible, epoxy resin, aluminium

1. Being an aircraft designer and artist, he widely used ..., and built light and elegant cars. 2. Surface oxides of chromium and nickel give the alloy excellent ..., allowing it to be used in aggressive environments. 3. Ukraine and Canada will join their efforts for high-tech 4. The new case is made of high-temperature material, glass 5. Any parts can be processed, excluding all items containing 6. Despite its strength, it is ... and can be stretched by 20 percent without any damage. 7. Composite materials are described as a material made from two or more constituents that are characterized by significantly different 8. Architectural engineering is a field that mainly focuses on ... and safety of buildings. 9. They chose carbon fibre because of its ... and low weight. 10. In electronics, ... protects circuits and transformers to avoid damage from dust or moisture.

4. Translate the following sentences into English using the words and word combinations below

high-temperature materials, structural elements, elasticity, to be sandwiched, traction and compression, a wing root, aggressive environments, to be coupled, brittleness, resistance to damage

1. Ця концепція містить геодезичний моніторинг осідань та деформацій фундаментів, а також інших важливих конструктивних елементів будівель і споруд. 2. Первинний параліч малогомілкового нерву асоційований з пошкодженням опорно-рухового апарату або виникає внаслідок ізольованого розтягнення і стиснення нерву. 3. Гармати встановлювалися у корені крила, боєкомплект розміщався зверху бака з окиснювачем, тобто у районі центру ваги літака. 4. У заглибних насосів немає конкурентів за ступенем захисту і стійкості до агресивного середовища. 5. Немає необхідності у дефіцитних високотемпературних матеріалах, за винятком сонячних концентраторів теплоти. 6. Але слід врахувати, що гартування призводить разом зі зміцненням металу до підвищення його крихкості. 7. Еластичність шкіри зменшується, що робить її більш вразливою до пошкоджень і розривів капілярів. 8. Також необхідно звернути увагу на щільність матеріалу, від якої залежить його стійкість до пошкоджень. 9. Бельгія – невеличка країна розміром зі штат Меріленд, затиснута між Німеччиною, Францією, Люксембургом та Нідерландами. 10. Концентратор вводу-виводу може бути з'єднаний з системною пам'яттю прямо або через контролер пам'яті.

5. Read the extracts below and fill in the gaps with the properties of materials for aircraft according to their brief descriptions

Plasticity / Ductility / Elasticity / Strength / Mechanical fatigue / Corrosion / Toughness / Brittleness / Stiffness

Several factors influence the selection of the structural materials for an aircraft. A brief description of some of the most important properties is given in the sequel:

(1) ... refers to a solid material's ability to deform under tensile stress, withstanding large strains before a fracture occurs. These large strains are accompanied by a visible change in cross-sectional dimensions and therefore give a warning of impending failure.

(2) ... of a material is its ability to withstand applied stress without failure. The applied stress may be tensile, compressive, or shear. It deals with loads, deformations, and the forces acting on a material.

(3) ... is the ability of a material to absorb energy and plastically deform without fracturing. This property requires a balance of strength and ductility. Strength indicates how much force the material can support, while this indicates how much energy a material can absorb before fracturing.

(4) ...: A brittle material exhibits little deformation before fracture, the strain normally being below 5 %. Brittle materials therefore may fail suddenly without visible warning. This and toughness are antonyms.

(5) ...: A material is said to be elastic if deformations disappear completely on the removal of the load.

(6) ... is the resistance of an elastic body to deformation by an applied force.

(7) ...: A material is perfectly plastic if no strain disappears after the removal of the load. Ductile materials are elastoplastic and behave in an elastic manner until the elastic limit is reached after which they behave plastically. When the stress is relieved the elastic component of the strain is recovered but the plastic strain remains as a permanent set.

(8) ... occurs due to the application of a very large number of relatively small cyclic forces which results in material failure.

(9) ... is the gradual destruction of materials (usually metals) by chemical reactions with their environment. Roughly speaking, it has to do with the oxidation of the material and thus the loss of some of its properties.

6. Translate the text from task 1 into Ukrainian.

Workshop 14

1. Read the text carefully before doing the tasks below

Outputs of the systems engineering process consist of the documents that define the system requirements and design solution. The physical architecture developed through the synthesis process is expanded to include enabling products and services to complete the system architecture. This system-level architecture then becomes the reference model for the further development of system requirements and documents. System engineering process outputs include the system and configuration item architectures, specifications, baselines, and the decision database.

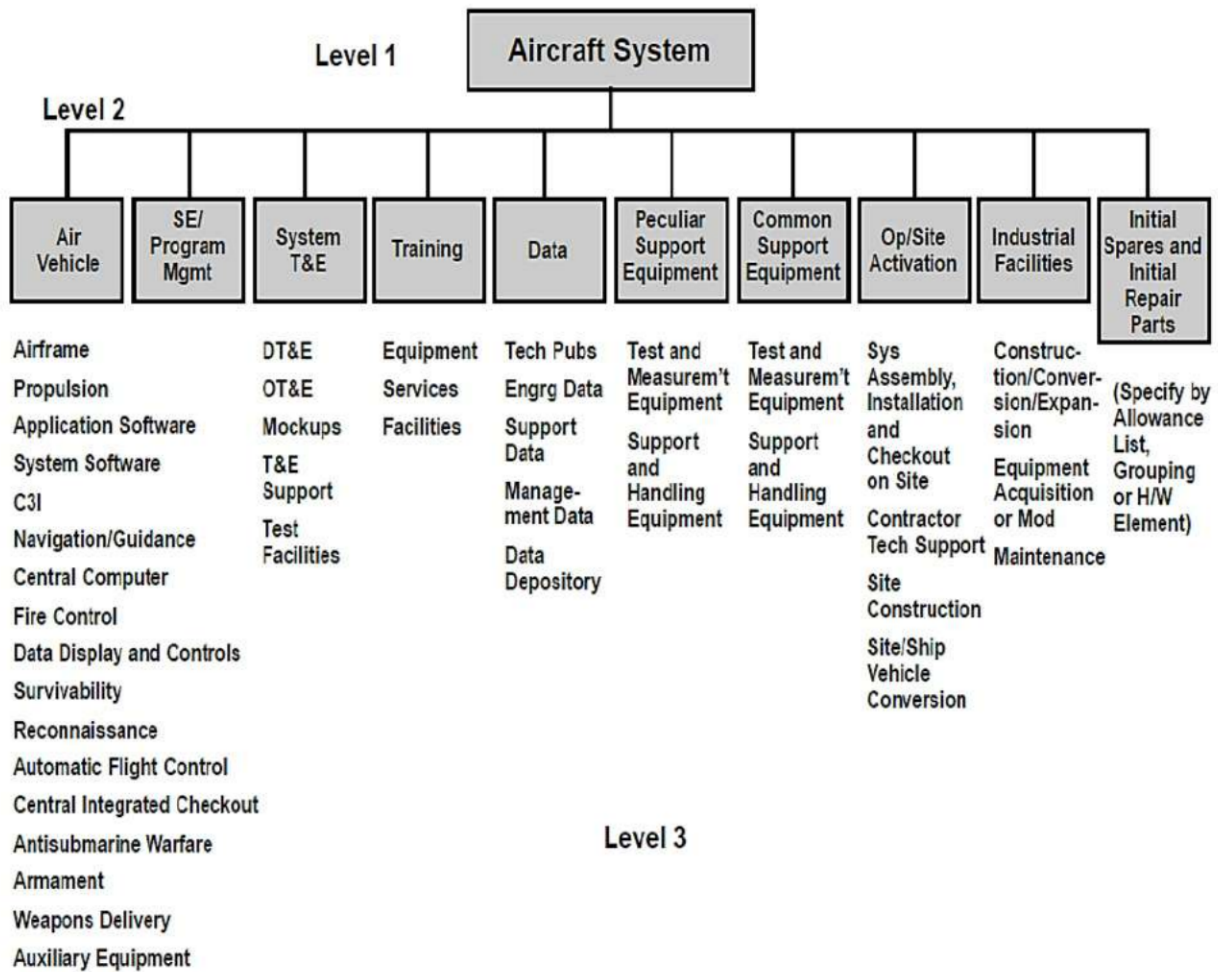
Outputs are dependent on the level of development. They become increasingly technically detailed as system definition proceeds from concept to detailed design. As each stage of system definition is achieved, the information developed forms the input for succeeding applications of the system engineering process.

The System Architecture describes the entire system. It includes the physical architecture produced through design synthesis and adds the enabling products and services required for life cycle employment, support, and management. Military Handbook (MIL-HDBK)-881, *Work Breakdown Structures*, provides reference models for weapon systems architectures. As shown by Figure 1, MIL-HDBK-881 illustrates the first three levels of typical system architectures. Program Offices can use MIL-HDBK-881 templates during system definition to help develop a top-level architecture tailored to the needs of the specific system considered. The design contractor will normally develop the levels below these first three.

A specification is a document that clearly and accurately describes the essential technical requirements for items, materials, or services including the procedures by which it can be determined that the requirements have been met. Specifications help avoid duplication and inconsistencies, allow for accurate estimates of necessary work and resources, act as a negotiation and reference document for engineering changes, provide documentation of configuration, and allow for consistent communication among those responsible for the eight primary functions of Systems Engineering. They provide IPTs a precise idea of the problem to be solved so that they can efficiently design the system and estimate the cost of design alternatives. They provide guidance to testers for verification (qualification) of each technical requirement.

During system development, a series of specifications are generated to describe the system at different levels of detail. These program unique specifications form the core of the configuration baselines.

Figure 1
Example from MIL-HDBK-881



Baselines formally document a product at some given level of design definition. They are references for the subsequent development to follow. Most DoD systems are developed using the three classic baselines described above: functional, allocated, and product. Though the program unique specifications are the dominant baseline documentation, they alone do not constitute a baseline.

Additional documents include both end and enabling product descriptions. End product baseline documents normally include those describing system requirements, functional architecture, physical architecture, technical drawing package, and requirements traceability. Enabling product baseline documents include a wide range of documents that could include manufacturing plans and processes, supportability planning, supply documentation, manuals, training plans and programs, test planning, deployment planning, and others. All enabling products should be reviewed for their susceptibility to impact from system configuration changes. If a document is one that describes a part of a system and could require change if the configuration changes, then most likely it should be included as a baseline document.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--------------------------|--|
| 1 | фізична архітектура | |
| 2 | технічні характеристики | |
| 3 | життєвий цикл | |
| 4 | шаблон | |
| 5 | проектний підрядник | |
| 6 | важливі технічні вимоги | |
| 7 | унікати дублювання | |
| 8 | конфігурація | |
| 9 | пакет технічних креслень | |
| 10 | посібник, керівництво | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

reconnaissance drones, mobile business applications, system requirements, additional configuration, a database, a specific definition, support data, weapons delivery systems, process system engineering, a central computer

1. In ..., mass and energy balances are the fundamental subject. 2. The side of the package has a list of ... for optimal performance of the graphics accelerator. 3. The module does not require ..., after installation and activation it is immediately ready for use. 4. ... can offer many benefits to almost any company. 5. Unlike organic standards, there is no ... for local food. 6. Customer ... is collected on a case-by-case basis and stored for the purpose of resolving disputes and service quality issues. 7. That includes in particular the help with secure communications and 8. Initially, helicopters operated as ..., attacking with air-launched torpedoes and depth charges based on information provided by its parent and other warships. 9. According to ..., the manager can also distribute the picking of orders, control offers on commodity items, and make elementary management decisions. 10. My devices are controlled by different protocols managed by ..., a mobile phone, and independently.

4. Translate the following sentences into English using the words and word combinations below

a case-by-case basis, manufacturing, testers, official documents, nuclear power engineering, organs system development, a plasma propulsion, system architecture, susceptibility

1. Проаналізовано існуючі підходи до проектування мультиагентних систем та обґрунтовано додаткові завдання, що виникають у процесі розробки архітектури системи. 2. Чотири власних заводи з виробництва комбікормів дають можливість спланувати індивідуальні раціони для птиці у

залежності від її виду, віку, призначення тощо. 3. У бета-фазі програма стає доступною для набагато більшої кількості тестувальників. 4. Між багатьма державами була спрощена процедура консульської легалізації офіційних документів. 5. Генетична схильність є єдиним відомим фактором ризику, отже захворювання передається спадково. 6. Вимоги можуть бути пов'язані з будь-якими аспектами, зокрема результативністю, ефективністю або відслідковуваністю. 7. Плазмовий двигун – це тип електричного двигуна, який створює тягу за допомогою квазінейтральної плазми. 8. Гравітація впливає на всі аспекти розвитку хребетних, зокрема клітинну структуру та функціонування, розвиток системи органів і навіть поведінки. 9. Атомна енергетика перетворилася на основний стабілізуючий фактор енергетичної системи країни. 10. Не існує жодної офіційної мінімальної або максимальної суми, кожен випадок розглядається індивідуально.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

DoD policy is to develop performance specifications ... procurement and acquisition. In general, detail specifications are left ... contractor development and use. Use ... a detail specification in DoD procurement or acquisition should be considered only where absolutely necessary, and then only ... supporting trade studies and acquisition authority approval.

DoD policy gives preference to the use ... commercial solutions to government requirements, rather than the development ... unique designs. Therefore, the use ... commercial item specifications and descriptions should be a priority ... system architecture development. Only when no commercial solution is available should government detail specifications be employed.

In the case ... re-procurement, where detail specifications and drawings are government-owned, standardization or interface requirements may present a need ... use of detailed specifications. Trade studies that reflect total ownership costs and the concerns related ... all eight primary functions should govern decisions concerning the type of specification used ... the re-procurement of systems, subsystems, and configuration items. Such trade studies and cost analysis should be performed prior to the use of detail specifications or the decision to develop and use performance specifications in a re-procurement.

Performance Specifications state requirements in terms of the required results with criteria ... verifying compliance, but without stating the methods for achieving the required results. In general, performance specifications define products ... terms of functions, performance, and interface requirements. They define the functional requirements ... the item, the environment in which it must operate, and interface and interchangeability characteristics. The contractor is provided the flexibility to decide how the requirements are best achieved, subject to the constraints imposed by the government, typically ... interface

requirements. System Specifications and Item Performance Specifications are examples of performance specifications.

Detail Specifications, such as Item Detail, Material, and Process Specifications, provide design requirements. This can include materials to be used, how a requirement is to be achieved, or how an item is to be fabricated or constructed. If a specification contains both performance and detail requirements, it is considered a Detail Specification, ... the following exception: Interface and interchangeability requirements in Performance Specifications may be expressed in detailed terms. For example, a Performance Specification ... shoes would specify size requirements ... detailed terms, but the material or method of construction would be stated in performance terms.

6. Translate the text from task 1 into Ukrainian.

Workshop 15

1. Read the text carefully before doing the tasks below

Ship machinery installations have two principal sources of excitation: the main engine(s) and the propeller(s). The two components are essentially linked by elastic shaft systems and may also embrace gearboxes and elastic couplings. The whole system is supported in flexible hull structures, and the forms of vibration possible are therefore diverse.

Problems in analysing ship machinery vibration have been compounded in recent years by the introduction of new fuel-efficient engine designs exploiting lower running speeds, longer stroke/bore ratios and higher combustion pressures. Another factor is the wider use of more complex machinery arrangements including, for example, power take-offs, shaft alternators, exhaust gas power turbines and multiple geared engines. The wider popularity of four- and five-cylinder low speed two-stroke engines for propulsion plant – reflecting attractive installation and operating costs – has also stimulated efforts by designers to counteract adverse vibration characteristics.

The greater complexity of vibration problems dictates a larger number of calculations to ensure satisfactory vibration levels from projected installations. For optimum results the vibration performance of the plant has to be investigated for all anticipated operational modes. In one case cited by Sulzer, in which two unequal-sized low speed engines were geared to a single controllable pitch propeller with a pair of PTO-driven generators, some eleven different operational configurations were possible.

Sophisticated tools such as computer software and measuring systems are now available to yield more detailed and accurate analysis of complex vibration problems. Even so, inaccuracies in determining shaft stiffness, damping effects,

coupling performance and hull structure response make it advisable in certain borderline cases to allow, at the design stage, for suitable countermeasures to be applied after vibration measurements have been taken during sea trials.

Both MAN B&W Diesel and Wartsila (Sulzer) stress that proper consideration should be given to the vibration aspects of a projected installation at the earliest possible stage in the ship design process. The available countermeasures provide a good safety margin against potential vibration problems. Close collaboration is desirable between naval architects, machinery installation designers, engine builders and specialist component suppliers. MAN B&W Diesel emphasises that the key factor is the interaction with the ship and not the mere magnitude of the excitation source.

Excitations generated by the engine can be divided into two categories:

- *Primary excitations*: forces and moments originating from the combustion pressure and the inertia forces of the rotating and reciprocating masses. These are characteristics of the given engine which can be calculated in advance and stated as part of the engine specification with reference to a certain speed and power.
- *Secondary excitations*: stemming from a forced vibratory response in a ship sub-structure. The vibration characteristics of substructures are almost independent of the remaining ship structure.

Examples of secondary excitation sources from sub-structures could be anything from transverse vibration of the engine structure to longitudinal vibration of a radar or light mast on top of the deckhouse. Such sub-structures of the complete ship might have resonance or be close to resonance conditions, resulting in considerable dynamically magnified reaction forces at their interface with the rest of the ship. Secondary excitation sources cannot be directly quantified for a certain engine type but must be calculated at the design stage of the specific propulsion plant.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|---------------------------|--|
| 1 | збудження | |
| 2 | пружний вал | |
| 3 | коробка передач | |
| 4 | багатоступінчастий двигун | |
| 5 | жорсткість валу | |
| 6 | заходи протидії | |
| 7 | величина | |
| 8 | поперечна вібрація | |
| 9 | поздовжня вібрація | |
| 10 | інтерфейс | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a fuel-efficient engine, ship machinery, an installation process, to be calculated, a hull structure, a propulsion plant, noise and vibration characteristics, sea trials, a primary excitation, a high-pressure combustion system

1. Sludge oil is a term commonly used to describe the waste oil mainly derived from the process of purifying fuel oils and lubricating oils in order to ensure proper operation of 2. The main engine and auxiliary machinery of a ship are usually connected with the base of ... by steel or cast-iron gaskets. 3. Firewall with counterweight and ... – no risk of backfire. 4. Its ... consists of two nuclear reactors. 5. The manufacturer guarantees preservation of all qualities SUV and off-road enthusiasts, this hybrid version with ... is the perfect car. 6. In September last year, the submarine first went to sea on 7. Glutamate is ... neurotransmitter (promotes stimulation) in the body. 8. The new engine generation is even more efficient and clean and offers further improved 9. Only after the tasks have been set, appropriate equipment is selected for them, and the best position for installing the cameras 10. Protective block construction simplifies ..., providing reliable and long-lasting protection from unfavorable external factors.

4. Translate the following sentences into English using the words and word combinations below

emissions, a shaft punch, physical magnitudes, substructures, a counterweight, deckhouses, lubricating oil, an anti-vibration system, a submarine, negative external factors

1. Пуансон проміжного валу служить для передачі обертальних і зворотно-поступальних імпульсів. 2. Різні палубні надбудови та вентиляційні труби перешкождали веденню вогню прямо по курсу. 3. На професійних пристроях часто є антивібраційна система, яка істотно знижує навантаження на руки. 4. Найправильнішим рішенням є розкладання кожної структури даних ядра на невеликі незалежні підструктури. 5. Незалежна Україна як опора демократії є єдиною реальною протипагою РФ у регіоні. 6. В'язкість мастила стає меншою із підвищенням температури. 7. Дерев'яні поверхні можуть значно пошкодитись під впливом негативних зовнішніх чинників. 8. Будь-який підводний човен, який запускає суперкавітаційну торпеду, миттєво видає своє приблизне місцезнаходження. 9. Під час використання водню у якості пального у системах згоряння, зокрема у ДВЗ, водень спалюється з мінімальними викидами. 10. У будь-якій квантовій системі всі фізичні величини не можуть одночасно дорівнювати нулю.

5. Put the paragraphs of the text in the correct order

(a) Limiting torsional vibration is vitally important to avoid damage or even fracture of the crankshaft or other propulsion system elements. Classification societies, therefore, require torsional vibration characteristics of the engine/shafting system to be calculated, with verification by actual shipboard measurements. Two limits are laid down for the additional torsional stresses. The lower limit T1 determines a stress level that may only be exceeded for a short time; this dictates a 'barred' speed range of revolutions in which continuous operation is prohibited. The upper stress limit T2 must never be exceeded.

(b) Torsional vibration involves the whole shaft system of the propulsion plant, embracing engine crankshaft, intermediate shafts, and propeller shaft, as well as engine running gear, flywheel, propeller, and (where appropriate) reduction gearing, flexible couplings, clutches, and power take-off drives.

(c) Owing to the very large variety of possible shafting arrangement that may be used in combination with a specific engine only detailed torsional vibration calculations for the individual plant can determine whether or not a torsional vibration damper is necessary.

(d) Torsional vibration causes extra stresses, which may be detrimental to the shaft system. The stresses will show peak values at resonances: that is, where the number of revolutions multiplied by the order of excitation corresponds to the natural frequency.

(e) Taking a shaft line of a certain length, it is possible to modify its natural frequency of torsional vibration by adjusting the diameter: a small diameter results in a low natural frequency, and a larger diameter in a high natural frequency. The introduction of a tuning wheel will also lower the natural frequency.

(f) The varying gas pressure in the cylinders during the working cycle and the crankshaft/connecting rod mechanism create a varying torque in the crankshaft. It is these variations that cause the excitation of torsional vibration of the shaft system. Torsional excitation also comes from the propeller through its interaction with the non-uniform wake field. Like other excitation sources, the varying torque is cyclic in nature and thus subject to harmonic analysis. Such analysis makes it possible to represent the varying torque as a sum of torques acting with different frequencies which are multiples of the engine's rotational frequency.

6. Translate the text from task 1 into Ukrainian.

Workshop 16

1. Read the text carefully before doing the tasks below

The International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations that was created in 1944 to promote the safe and orderly development of international civil aviation throughout the world. It sets standards and regulations necessary for aviation safety, security, efficiency, and regularity, as well as for aviation environmental protection.

Why are standards necessary?

Civil aviation is a powerful force for progress in our modern global society. A healthy and growing air transport system creates and supports millions of jobs worldwide. It forms part of the economic lifeline of many countries. It is a catalyst for travel and tourism, the world's largest industry. Beyond economics, air transport enriches the social and cultural fabric of society and contributes to the attainment of peace and prosperity throughout the world.

Twenty-four hours a day, 365 days of the year, an airplane takes off or lands every few seconds somewhere on the face of the earth. Every one of these flights is handled in the same, uniform manner, whether by air traffic control, airport authorities, or pilots at the controls of their aircraft. Behind the scenes are millions of employees involved in manufacturing, maintenance, and monitoring of the products and services required in the never-ending cycle of flights. In fact, modern aviation is one of the most complex systems of interaction between human beings and machines ever created.

This clock-work precision in procedures and systems is made possible by the existence of universally accepted standards known as Standards and Recommended Practices, or SARPs. SARPs cover all technical and operational aspects of international civil aviation, such as safety, personnel licensing, operation of aircraft, aerodromes, air traffic services, accident investigation, and the environment. Without SARPs, our aviation system would be at best chaotic and at worst unsafe.

How it works

The constitution of ICAO is the Convention on International Civil Aviation, drawn up by a conference in Chicago in November and December 1944, and to which each ICAO Contracting State is a party. According to the terms of the Convention, the Organization is made up of an Assembly, a Council of limited membership with various subordinate bodies and a Secretariat. The Assembly, composed of representatives from all Contracting States, is the sovereign body of ICAO. It meets every three years, reviewing in detail the work of the Organization and setting policy for the coming years.

Foundation of ICAO

The consequence of the studies initiated by the US and subsequent consultations between the Major Allies was that the US government extended an invitation to 55 states or authorities to attend, in November 1944, an International Civil Aviation Conference in Chicago. Fifty-four states attended this conference end of which a Convention on International Civil Aviation was signed by 52 States set up the permanent International Civil Aviation Organization (ICAO) as a mean to secure international cooperation a highest possible degree of uniformity in regulations and standards, procedures, and organization regarding civil aviation matters.

The most important work accomplished by the Chicago Conference was in the technical field because the Conference laid the foundation for a set of rules and regulations regarding air navigation as a whole which brought safety in flying a great step forward and paved the way for the application of a common air navigation system throughout the world.

From the very assumption of activities of ICAO, it was realized that the work of the Secretariat, especially in the technical field, would have to cover the following major activities: those which covered generally applicable rules and regulations concerning training and licensing of aeronautical personnel both in the air and on the ground, communication systems and procedures, rules for the air and air traffic control systems and practices, airworthiness requirements for aircraft engaged in international air navigation as well as their registration and identification, aeronautical meteorology, and maps and charts. For obvious reasons, these aspects required uniformity on a world-wide scale if truly international air navigation was to become a possibility.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|---------------------------------|--|
| 1 | цивільна авіація | |
| 2 | сучасне світове суспільство | |
| 3 | управління повітряним рухом | |
| 4 | складна система взаємодії | |
| 5 | точність як у годинника | |
| 6 | розслідування нещасного випадку | |
| 7 | відповідно до умов | |
| 8 | аеронавігація | |
| 9 | вимоги льотної придатності | |
| 10 | авіаційна метеорологія | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a modern fire control system, air roots, aviation safety, civil aviation, aerodromes, licensing procedures, a never-ending cycle, principles and methods, the Convention on International Civil Aviation, prosperity

1. The presentations of the students highlighted problems of ... at the national and international levels. 2. ... authorities, the police, customs and border control are authorized to make airport screening of hand luggage, baggage and personal inspection of the civil aircraft passengers. 3. We educate global leaders who create sustainable ... worldwide. 4. The ... of destruction and change inherent in a capitalist economy always provides new opportunities for those with determination, goals and concentration. 5. It provides the ability to operate aircraft from high altitude ... in any geographical and climatic conditions. 6. Most transatlantic ... pass through New York. 7. The system of work with personnel is a set of ... of management of workers and employees in the organization. 8. This new fire support vehicle has got ... and the latest generation optics. 9. In general, to simplify ... there are about 30 regulatory legal acts will be developed and adopted. 10. The draft seems to be in compliance with ..., which obliged states to provide safe conditions for civil aircraft in the areas where drones are used.

4. Translate the following sentences into English using the words and word combinations below

registration and identification, global leaders, an application, machine building, international cooperation, executive authorities, to provide safe conditions, aircraft passengers, determination, educational establishments

1. Вже сьогодні ми працюємо з компаніями, більшість з яких у майбутньому стане світовими лідерами. 2. Характерна особливість японського виробництва, особливо машинобудування, – співіснування великого виробництва з дрібним. 3. Студенти і дослідники отримують користь від міжнародного співробітництва, що надає їм змогу ділитися досвідом та бути обізнаними з останніми досягненнями світової науки. 4. Вони представляють та захищають інтереси членів в органах законодавчої та виконавчої влади України та міжнародних організаціях. 5. Їхня рішучість і відданість справі – це саме те, що нам потрібно у цей вирішальний момент. 6. Учасники всіх навчальних закладів міста отримали від міської влади подяки і подарунки. 7. Ми створюємо безпечні умови та забезпечуємо мінімізацію стресу під час догляду та транспортування. 8. Додаток (веб-додаток або консольний додаток) має єдиний вхідний скрипт. 9. Пасажирів літаків розвертали по прибуттю в українські аеропорти, а провідники поїздів заздалегідь попереджали про ситуацію на

українському кордоні. 10. Програми обов'язкової реєстрації та ідентифікації полегшують ефективне використання цього механізму.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

Chicagos's convention

In response ... the invitation ... the United States Government, representatives of 54 nations met in Chicago from November 1 to December 7, 1944, to make arrangements ... the immediate establishment of provisional world air routes and services and ... set up an interim council to collect, record and study data concerning international aviation and to make recommendations ... its improvement. The Conference was also invited to discuss the principles and methods to be followed in the adoption ... a new aviation convention.

Convention ... International Civil Aviation (also known as Chicago Convention), was signed on 7 December 1944 by 52 States. Pending ratification of the Convention by 26 States, the Provisional International Civil Aviation Organization (PICAO) was established.

It functioned from 6 June 1945 until 4 April 1947. By 5 March 1947, the 26th ratification was received. ICAO came into being on 4 April 1947. In October of the same year, ICAO became a specialized agency of the United Nations linked ... Economic and Social Council (ECOSOC). The Convention ... International Civil Aviation set forth the purpose of ICAO:

WHEREAS the future development ... international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples ... the world, yet its abuse can become a threat ... the general security; and

WHEREAS it is desirable to avoid friction and to promote that cooperation between nations and peoples upon which the peace of the world depends;

THEREFORE, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed ... a safe and orderly manner and that international air transport services may be established ... the basis of equality of opportunity and operated soundly and economically;

Have accordingly concluded this Convention to that end.

The Convention has since been revised eight times (in 1959, 1963, 1969, 1975, 1980, 1997, 2000 and 2006). It is constituted ... a preamble and 4 parts:

- Air navigation.
- Organization of international civil aviation.
- International air transport.
- Final dispositions.

6. Translate the text from task 1 into Ukrainian.

Workshop 17

1. Read the text carefully before doing the tasks below

Configuration management permits the orderly development of a system, subsystem, or configuration item. A good configuration management program ensures that designs are traceable to requirements, that change is controlled and documented, that interfaces are defined and understood, and that there is consistency between the product and its supporting documentation. Configuration management provides documentation that describes what is supposed to be produced, what is being produced, what has been produced, and what modifications have been made to what was produced.

Configuration management is performed on baselines, and the approval level for configuration modification can change with each baseline. In typical system development, customers or user representatives control the operational requirements and usually the system concept. The developing agency program office normally controls the functional baseline. Allocated and product baselines can be controlled by the program office, the producer, or a logistics agent depending on the life cycle management strategy. This sets up a hierarchy of configuration control authority corresponding to the baseline structure. Since lower-level baselines have to conform to a higher-level baseline, changes at the lower levels must be examined to assure they do not impact a higher-level baseline. If they do, they must be approved at the highest level impacted. For example, suppose the only engine turbine assembly affordably available for an engine development cannot provide the continuous operating temperature required by the allocated baseline. Then not only must the impact of the change at the lower level (turbine) be examined, but the change should also be reviewed for possible impact on the functional baseline, where requirements such as engine power and thrust might reside.

Configuration management is supported and performed by integrated teams in an Integrated Product and Process Development (IPPD) environment. Configuration management is closely associated with technical data management and interface management. Data and interface management is essential for proper configuration management, and the configuration management effort has to include them.

When planning a configuration management effort, you should consider the basics: what has to be done, how should it be done, who should do it, when should it be done, and what resources are required. Planning should include the organizational and functional structure that will define the methods and procedures to manage functional and physical characteristics, interfaces, and documents of the system component. It should also include statements of responsibility and authority, methods of control, methods of audit or verification, milestones, and schedules. EIA IS-649, National Consensus

Standard for Configuration Management, and MIL-HDBK-61 can be used as planning guidance.

A key concept that affects planning is the configuration item (CI). CI decisions will determine what configurations will be managed. CIs are an aggregation of hardware, firmware, or computer software, or any of their discrete portions, which satisfy an end-use function and are designated for separate configuration management. Any item required for logistic support and designated for separate procurement is generally identified as CI. Components can be designated CIs because of crucial interfaces or the need to be integrated with operation with other components within or outside of the system. An item can be designated CI if it is developed wholly or partially with government funds, including non-developmental items (NDI) if additional development of technical data is required. All CIs are directly traceable to the WBS.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|------------------------------------|--|
| 1 | управління конфігурацією | |
| 2 | узгодженість | |
| 3 | представник користувача | |
| 4 | операційні вимоги | |
| 5 | ієрархія | |
| 6 | доступний | |
| 7 | сукупність апаратного забезпечення | |
| 8 | логістичне забезпечення | |
| 9 | закупівля, постачання | |
| 10 | повністю або частково | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

technical data, government funds, an investment project, a management strategy, computer software, low humidity, environmental-friendly, to be integrated, a functional structure, strategic planning

1. A sequence of the main stages for the development of a system of monitoring the implementation of ... at an enterprise is defined. 2. Every risk ... is tailored to the specific case, and tools and methods for minimizing risks will be different in each situation. 3. The high temperature of air accompanied by ... and normal or slightly increased pressure is much easier to carry. 4. His task is to create favourable conditions at the legislative level to stimulate demand for ... transport. 5. While the use of computers in daily life increases, the importance of ... is also increasing day by day. 6. ... are the main source of financing for the scientific sector. 7. All interns may expect ... into teams and to be given more and more independent assignments. 8. There is near unanimity among biologists

that this ... is a product of natural selection. 9. More detailed ... is expected to be released by the company's management representatives at the Paris Motor Show this year. 10. The realization of strategic management goals usually depends on

4. Translate the following sentences into English using the words and word combinations below

on the legislative level, supporting documentation, an arms industry, favourable conditions, internet access, to be managed, crucial, a turbine, firmware, a melting point

1. Гарантуємо наявність усієї супровідної документації про якість продукції, згідно з нормативними документами на сировину. 2. Країна потребує реформ для створення більш сприятливих умов співпраці між наукою і промисловістю, європейськими та міжнародними партнерами. 3. Інформація зараз є стратегічним ресурсом, який має використовуватися ефективно для того, щоб досягнути переваги. 4. Однією з можливостей забезпечення незалежності Національної ради є закладення передумов такої незалежності на рівні закону. 5. Інтернет-провайдер насамперед надає доступ до інтернету як послугу для своїх клієнтів. 6. Ми зробили важливі кроки для перетворення Києва у цікаве для інвесторів місто. 7. Швидка індустріалізація, що відбулася після 1930 року, створила інфраструктуру, необхідну для розвитку військової промисловості. 8. Металокерамічне теплозахисне покриття призначене для захисту проточної частини турбін рідинних ракетних двигунів і являє собою композицію на основі скла, металу і кремнію. 9. Ця прошивка підтримує широкий спектр обладнання та розповсюджується абсолютно безкоштовно. 10. Використання металу вольфраму пояснюється головно його високою температурою плавлення і значною міцністю за високих температур.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

Configuration Audits are used to verify a system and its component's conformance to their configuration documentation. Audits are key milestones in the development ... the system and do not stand alone. The next chapter will show how they fit ... the overall process ... assessing design maturity.

Functional Configuration Audits (FCA) and the System Verification Review (SVR) are performed in the Production Readiness and LRIP stage of the Production and Development Phase. FCA is used to verify that the actual performance ... the configuration item meets specification requirements. The SVR serves as a system-level audit after FCAs have been conducted.

The Physical Configuration Audit (PCA) is normally held during the Rate Production and Development stage as a formal examination ... a production

representative unit against the draft technical data package (product baseline documentation).

Most audits, whether FCA or PCA, are today approached ... a series of “rolling” reviews in which items are progressively audited as they are produced such that the final FCA or PCA becomes significantly less oppressive and disruptive ... the normal flow of program development.

6. Translate the text from task 1 into Ukrainian.

Workshop 18

1. Read the text carefully before doing the tasks below

Particulate generation in diesel engines is a complex process depending on numerous factors (such as engine type, speed, engine setting, operating mode, load, fuel and even weather conditions), explains MAN B&W Diesel.

Particulates comprise all solid and liquid exhaust gas components which, after cooling by exhaust gas dilution with filtered particulate free ambient air to a temperature below 51.7°C, are collected on specified filters (dilution tube sampling). The so-called PM fraction represents a broad mixture of: partly-burned or unburned hydrocarbons; sulphate-bound water; sulphates; ash; and elemental carbon (soot).

Soot and ash are therefore only part of the total particulates. At high loads, ash and soot might contribute less than 20 per cent to the particulates, but at low loads and idling this percentage can be much higher.

The specific mass of all particulates from modern MAN B&W medium speed diesel engines averages around 0.6 g/kWh at maximum continuous rating, assuming heavy fuel oil with a 2 per cent sulphur content is burned. Lower particulate values can be achieved, however, the company citing a PM value of 0.2 g/kWh from the four 18V48/60 engines of a floating barge.

Much of the elemental carbon formed in a diesel engine is oxidized during combustion and only the remainder leaves the combustion space with the exhaust gas as soot, which becomes visible as a dark smoke plume emanating from the funnel. There is a clear correlation between the level of soot formation and the type of fuel used; heavy fuel oil combustion generates substantially greater volumes of particles (and soot) than the burning of cleaner fuels, such as marine diesel and marine gas oils. While soot particles themselves are not toxic, notes MAN B&W Diesel, the potential hazard posed by the build-up of liquid hydrocarbons onto them is viewed critically by many.

At very high engine loads, combustion in a state-of-the-art medium-speed diesel engine can be modelled to give invisible smoke. At low service loads, however, and especially during rapid start-up manoeuvres and load changes, the turbochargers deliver less intake air than the engine needs for complete

combustion and the engine ‘smokes’. Smoke as the visible manifestation of soot production is highly undesirable in all types of ships, particularly in passenger ferries and cruise liners. In sensitive waters, such as the glacier regions and bays of Alaska or the Galapagos Islands, a vessel producing excessive amounts of visible soot (smoke) can even be banned from cruising there. Achieving zero emissions may dictate shutting down all engines and boilers during a port stay, and plugging into a land-based electrical supply system.

MAN B&W Diesel designed and successfully field-tested a package of measures to suppress the formation of soot in highly turbocharged medium speed engines, even during long periods of slow steaming.

The full package for these IS (invisible smoke) near-zero soot engines with low NO_x emissions comprises:

- Turbocharger optimized for part load, with a waste gate.
- Charge air bypass below 65 per cent engine load.
- Charge air preheating (80°C) below 20 per cent load.
- Smaller injection bores.
- Nozzles with short sac holes.
- Auxiliary blower for operation below 20 per cent load.
- Fuel-water emulsification (15–20 per cent water).
- Retarded fuel injection below 80 per cent engine load.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--|--|
| 1 | режим роботи | |
| 2 | тверді та рідкі компоненти вихлопних газів | |
| 3 | розрідження | |
| 4 | незгорілі вуглеводні | |
| 5 | частки | |
| 6 | плавуча баржа | |
| 7 | сажа, кіптява | |
| 8 | потенційна небезпека | |
| 9 | турбокомпресор | |
| 10 | паливно-водне емульгування | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

a filter, to be oxidized, zero emissions, a confined space, smoke plumes, toxic particulates, heavy fuel oil, passenger ferries, an automatic transmission, blood sampling

1. Vacuum tubes for ... are often used in paediatrics. 2. A diesel particulate ... is a special automobile device that helps to clean the exhaust of a diesel engine

from a large amount of soot. 3. Aluminium ... very slightly because the formation of an oxide film needs just a few seconds. 4. According to official data, the content of ... in the London air exceeds the maximum permissible standards three times, which negatively affects the health of citizens. 5. In some cases, high oxygen content in ... may cause unexpected chemical reactions or combustion. 6. ... from fires have spread throughout the Amazon and beyond. 7. Low-grade fuel oils, such as ... used on marine vessels or for power generation can be emulsified with water to combust more efficiently. 8. Perhaps the most successful commercial market penetration of solar at sea or on inland waterways is as the primary power source for 9. Global urbanization requires urban logistics and truck transport with ... and less noise with increasing urgency. 10. The diesel turbocharged engine by Peugeot is equipped with ... is smooth and responsive.

4. Translate the following sentences into English using the words and word combinations below

liquefied natural gas, cruise liners, a funnel, a harmful chemical reaction, weather conditions, a burner, migration and urbanization, a vessel, a maximum permissible standard, state-of-the-art

1. Сучасні круїзні лайнери – це, по суті, велетенські п'ятизіркові готелі. 2. Прийом ацетилсаліцилової кислоти разом з алкоголем викликає шкідливу для здоров'я хімічну реакцію, яка здатна фактично зруйнувати деякі органи. 3. Величезна маса води, що обертається, утворює воронку, яка затягує не лише людей, а й кораблі. 4. А завдяки сухому спирту від пальника зовсім немає диму, що допоможе солдатам лишатися непомітними для ворога. 5. Глобальна міграція та урбанізація змінює не лише обличчя сучасного міста, а й умови проживання у ньому. 6. В усіх бездротових інструментах Bosch використовуються найсучасніші літій-іонні акумулятори. 7. Зимові шини для вантажівок спеціально розроблені для експлуатації у складних погодних умовах. 8. Суднові дизельні двигуни можуть працювати на зрідженому природному газі, що значним чином скорочує шкідливі викиди у порівнянні з традиційним паливом. 9. Традиційне полінезійське каное повернулося до Гонолулу, Гаваї, завершивши першу подорож навколо світу на такому судні. 10. Кількісна фальсифікація – це значні відхилення параметрів товару (маси, об'єму), що перевищують гранично допустимі норми відхилень.

5. Read the extract below, fill in the gaps with the missing prepositions, and make 5 questions to the text

Different fuel nozzle types and designs have a significant impact on NOx formation and the intensity of the fuel injection also have an influence. The increased mean effective pressure ratings ... modern engines require increased

flow areas throughout the fuel valve which, in turn, leads ... increased sac volumes in the fuel nozzle itself and a higher risk of after-dripping. Consequently, more fuel from the sac volume may enter the combustion chamber and contribute ... the emission ... smoke and unburned hydrocarbons as well as to increased deposits ... the combustion chamber. The relatively large sac volume ... a standard-design fuel nozzle thus has a negative influence ... the formation of soot particles and hydrocarbons.

The so-called 'mini-sac' fuel valve introduced ... MAN B&W Diesel incorporates a conventional conical spindle seat as well as a slide inside the fuel nozzle. The mini-sac leaves the flow conditions in the vicinity ... the nozzle holes similar ... the flow conditions ... the conventional fuel nozzle. But its much-reduced sac volume – only about 15 per cent that of the conventional fuel valve – has demonstrated a positive influence ... the cleanliness ... the combustion chamber and exhaust gas outlet ducts. Such valves also reduce the formation of NO_x during combustion.

A new type of fuel valve – essentially eliminating the sac volume – was subsequently developed and introduced by MAN B&W Diesel as a standard ... its larger low-speed engines. The main advantages of this slide-type fuel valve are reduced emissions of NO_x, CO, smoke and unburned hydrocarbons as well as significantly fewer deposits inside the engine. A positive effect ... the cylinder condition, in general, is reported.

Applying slide fuel valves to a 12K90MC containership engine yielded a 40 per cent reduction in smoke (BSN10) compared ... the mini sac valved engine, while hydrocarbons and CO were reduced by 33 per cent and 42 per cent, respectively, albeit from a low level. NO_x was reduced by 14 per cent, while the fuel consumption remained virtually unchanged and with a slight reduction at part load.

6. Translate the text from task 1 into Ukrainian.

Workshop 19

1. Read the text carefully before doing the tasks below

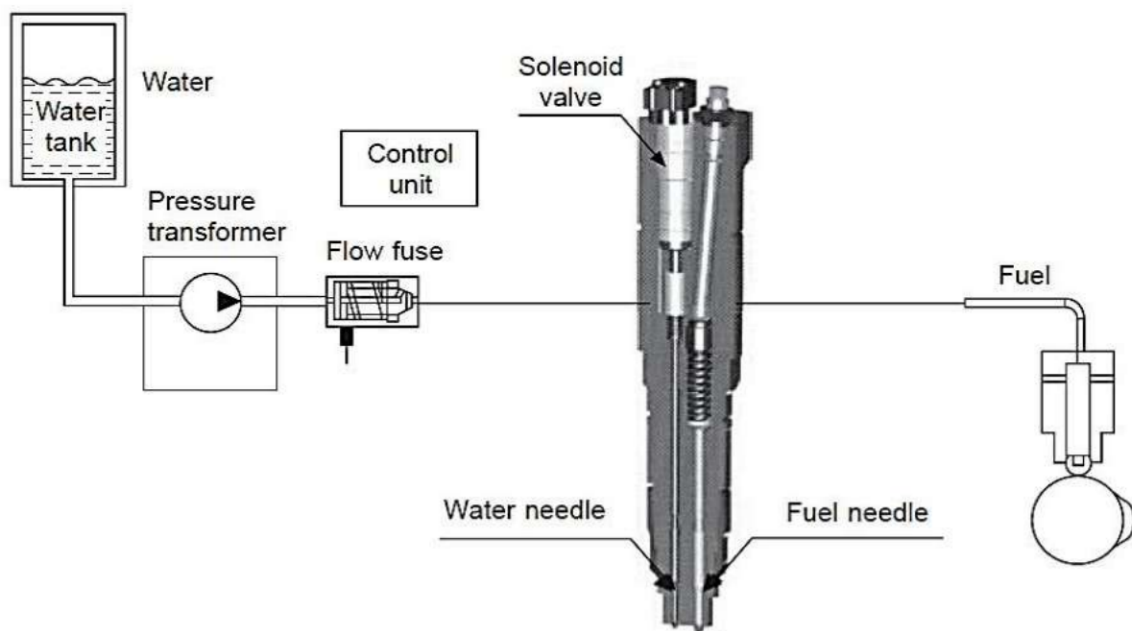
Water–fuel emulsions injected via the fuel valve achieve a significant reduction in NO_x production. The influence varies with the engine type but generally, 1 per cent of water reduces NO_x emissions by 1 per cent. Water can also be added to the combustion space through separate nozzles or by the stratified segregated injection of water and fuel from the same nozzle.

Direct Water Injection (DWI) is effective in reducing NO_x by adding mass and stealing heat from the combustion process when the water is evaporated. Wärtsilä developed DWI for its medium-speed engines after initially investigating

the merits of injecting ammonia into the cylinder during the expansion stroke. It was found that injecting water into the combustion chamber during the compression stroke could achieve the same degree of NO_x reduction as ammonia.

Wärtsilä medium speed engines with DWI systems feature a combined injection valve and nozzle for injecting water and fuel oil into the cylinder (Figure 1). The nozzle has two separate needles that are also controlled separately, such that neither mode (water on/water off) will affect the operation of the engine. The engine can be transferred to non-water operational mode at any load, the transfer in alarm, situations being automatic and instantaneous. Water injection takes place before fuel injection, resulting in a cooler combustion space and hence lower NO_x generation; water injection stops before fuel oil is injected into the cylinder so that the ignition and combustion process is not disturbed.

Figure 1
Wärtsilä's Direct Water Injection system features a combined injection valve and nozzle for water and fuel oil



Clean water is fed to the cylinder at a pressure of 210–400 bar (depending on the engine type) by a common rail system, the pressure is generated in a high-pressure pump module; a low-pressure pump is also necessary to ensure a sufficiently stable water flow to the high-pressure pump. The water is filtered before the low-pressure pump to remove all solid particles; the pumps and filters are built into modules to ease installation.

A flow fuse installed on the cylinder head side acts as a safety device, shutting off the water flow into the cylinder if the water needle gets stuck; immediate water shut-off is initiated in the event of excessive water flow or leakage. Water injection timing and duration are electronically-controlled by the control unit, which receives its input from the engine output; timing and

duration can be optimized conveniently via a keyboard for different applications. Space requirements for the equipment are minimal, facilitating retrofit applications.

Water and fuel are injected in a typical water-to-fuel ratio of 0.4–0.7:1, reducing NOx emissions by 50–60 per cent without adversely affecting power output or engine components. NOx emissions are typically 4–6 g/kWh when the engine is running on marine diesel oil and 5–7 g/kWh when heavy fuel oil is being burned. NOx reduction is most efficient from 40 per cent load and higher of nominal engine output.

Numerous applications of the above DWI system have benefited Wärtsilä 32 and 46 engines powering diverse ship types. Some W46 ‘EnviroEngines’ combine electronically-controlled common rail fuel injection with DWI, the water is then injected into the combustion chamber separately from the side of the cylinder head through a dedicated valve.

Mitsubishi Heavy Industries developed a stratified fuel-water injection (SFWI) system using a common valve to inject ‘slugs’ of fuel/water/fuel sequentially into the combustion chamber. The system reportedly worked in a stable condition throughout extensive trials on a ship powered by a Mitsubishi UEC 52/105D low-speed engine, NOx emission reduction being proportional to the amount of water injected.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|--------------------------------|--|
| 1 | паливний клапан | |
| 2 | впорскування | |
| 3 | випаровуватися | |
| 4 | стиснення | |
| 5 | безводний режим роботи | |
| 6 | миттєвий | |
| 7 | запалювання | |
| 8 | запобіжний пристрій (механізм) | |
| 9 | з електронним керуванням | |
| 10 | випробовування | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

solid particles, nozzles, a high-pressure pump, a magnetic compass, counter-rotating, to rotate, safe operation, a water flow, an optimum engine output, a combustion process, a cylinder

1. The most necessary additional function of any mixer is the ability to change 2. Oxygen, which enters through the air gap between the pipes, supports ... in the boiler. 3. Part of the concentrate is discharged into the sewage system

while the module is operating, and part of it is sent to the inlet of ... to recycle the concentrate. 4. The two streams of exhaust gases ... the turbine and create maximum torque at very low engine speeds. 5. A built-in emergency overpressure relief valve provides 6. Each toroidal gas cylinder is subject to testing under the pressure. 7. The rate of ... in the reaction zone and advance shall not exceed 1–1,5 mm/sec. 8. In order to obtain ... and to protect your health and the environment use unleaded fuel only. 9. This equipment is designed for the absorption and separation of contaminated exhaust gases, condensation of harmful vapours and capture of ... in gases. 10. The control unit has its own ..., and satellite navigation system.

4. Translate the following sentences into English using the words and word combinations below

built-in tools, plastic pipes, a sewage system, to protect someone's health, satellite navigation, absorption, inflammation, harmful substances, a stable condition, to obtain information by phone

1. Деякі причини засмічення каналізації не усуваються навіть найагресивнішим хімічним розчином. 2. Значне поглинання відбувається у крайній ультрафіолетовій області спектра довжин хвиль, починаючи з близько 100 нанометрів. 3. У зону реакції потрапляють лейкоцити і активні біологічні речовини, які провокують запалення. 4. Ця модель застосовується насамперед для захисту органів дихання від впливу шкідливих речовин, що перебувають у стані пари чи газу. 5. Пластикові труби ізолюють шум води, що протікає ними, незалежно від швидкості потоку. 6. Ангіографія зазвичай проводиться протягом 24–48 годин після надходження в лікарню, особливо якщо пацієнт перебуває у стабільному стані. 7. Пасажири, які мають сумніви щодо правил митного декларування та ввезення валюти, можуть отримати інформацію телефоном. 8. Щоб максимально підвищити ефективність, автомобіль за допомогою даних супутникової навігації розраховує оптимальне використання електродвигуна і ДВС для кожної поїздки. 9. На кожному комп'ютері під керуванням ОС Windows є вбудовані інструменти, які можна одразу використовувати. 10. Оливкова олія холодного віджиму містить речовини, що захищають ваше здоров'я і борються з проліферацією ракових клітин.

5. Read the extract below, fill in the gaps with the missing definite or indefinite articles, and make 5 questions to the text

Exhaust gas recirculation (EGR) is ... method of modifying ... inlet air to reduce NOx emissions, ... approach widely used in automotive applications. Some of ... exhaust gas is cooled and cleaned before recirculation to ... scavenged air side. Its effect on NOx formation is partly due to ... reduction of ... oxygen concentration in ... combustion zone, and partly due to ... content of

water and carbon dioxide in ... exhaust gas. The higher molar heat capacities of water and carbon dioxide lower ... peak combustion temperature which, in turn, curbs ... formation of NO_x.

EGR is ... very efficient method of reducing NO_x emissions (by 50–60 per cent) without affecting ... power output of ... engine but is considered more practical for engines burning cleaner bunkers such as low sulphur and low ash fuels, alcohol and gas. Engines operating on high sulphur fuel might invite corrosion of turbochargers, intercoolers and scavenging pipes.

Wärtsilä acknowledges that EGR leads to reductions in NO_x emissions but suggests its practical application is limited by ... fact that it quite soon starts to adversely affect combustion, leading to increased fuel consumption, particulates, unburned hydrocarbons and carbon monoxide. ... worse drawback is that, even with ... insignificant sulphur content in ... fuel, cooling down ... exhaust gas results in ... sticky liquid of sulphur acid products, water and soot matter. This makes it difficult to maintain ... functionality of ... cooling device and, above all, results in ... difficult residual product, says Wärtsilä, which abandoned EGR for diesel engine applications.

For low-speed engines, especially those with electronically-controlled exhaust valve timing, Wärtsilä suggests that ... Water Cooled Rest Gas (WaCoReG) technique offers ... opportunity for NO_x reduction. In this concept, some of ... exhaust gas is left in ... cylinder, which in normal circumstances leads to increased thermal loading and inferior combustion. These drawbacks are largely avoided, however, if ... rest gas is cooled by ... internal spray of water. As the surrounding combustion space components are rather hot, there will be no condensation of acid products on ... metal surfaces.

6. Translate the text from task 1 into Ukrainian.

Workshop 20

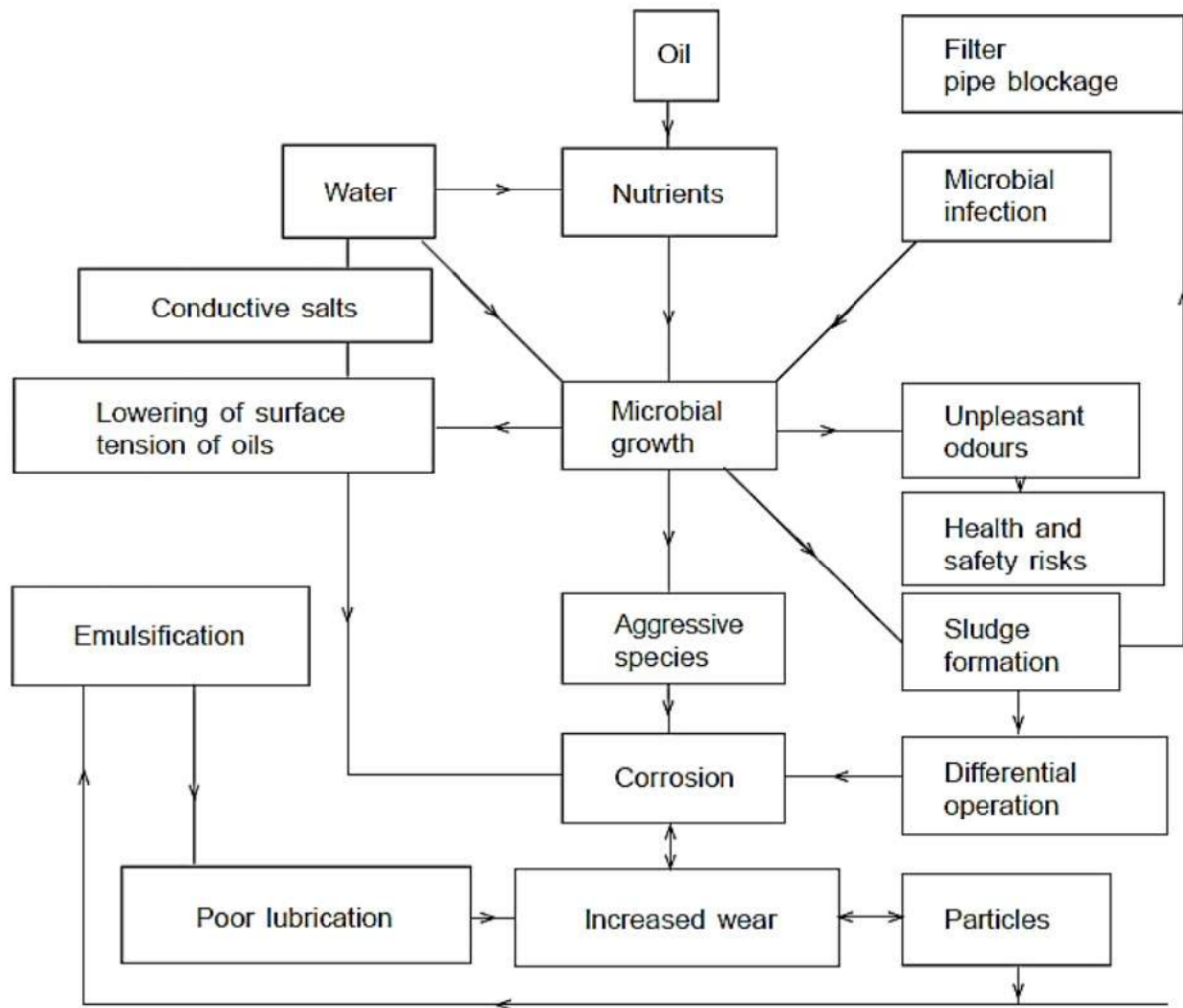
1. Read the text carefully before doing the tasks below

Lubricant operating temperatures of crankcase oils in wet engines are normally sufficient to control and prevent infestation. Any problems are usually associated with ships which have shut down their lubricant system, allowing temperatures to drop and water to accumulate.

There are many thousands of types of microbes but only a few are able to grow in lubricating oils at the elevated operational temperatures in use. Provided the plant treatment equipment is functional, the purifier heater temperature is maintained and the water content is kept at a minimum, the lubricating oil system will be both environmentally and nutrient deficient. Such conditions will prevent microbes from establishing themselves. Should heavy contamination of

the system occur, however, this self-regulating mechanism will be unable to prevent microbial proliferation (Figure 1). Fortunately, the symptoms of microbial contamination will not occur immediately, allowing engineers to implement remedial physical and/or chemical decontamination programmes.

Figure 1
Interactive problems associated with microbial corrosion (Lloyd's Register)



The visual symptoms of microbial contamination of lubricants are:

- Slimy appearance of the oil, the slime tending to cling to the crankcase doors.
- Rust films.
- Honey-coloured films in the journals, later associated with corrosion pitting.
- Black stains on white-metal bearings, pins and journals.
- Brown or grey/black deposits on metallic parts.
- Corrosion of the purifier bowl and newly machined surfaces.

- Sludge accumulation in the crankcase and excessive sludge at the purifier discharge.
- Paint stripping in the crankcase.

The operational symptoms of microbial contamination in lubricants are:

- Additive depletion.
- Rancid or sulphitic smells.
- Increase in oil acidity or sudden loss of alkalinity.
- Stable water content in the oil which is not resolved by the purifier.
- Filter plugging in heavy weather.
- Persistent demulsification problems.
- Reduction of heat transfer in coolers.

Microbial growth occurs in the water associated with the lubricant, and the phenomenon is therefore characteristic of crankcase oils in wet engines, particularly those with water-cooled pistons. Lubricant infection can be identified by slimy film formation on the crankcase doors. There may also be a rancid odour and white-metal parts may be stained black. As the problem progresses, filters choke up, organic acids are formed and the oils tend to emulsify.

2. Find the English equivalents in the text and commit them to memory

| | | |
|----|------------------------------|--|
| 1 | мастильний матеріал, мастило | |
| 2 | зараження, інвазія | |
| 3 | різновиди мікробів | |
| 4 | забруднення | |
| 5 | механізм саморегуляції | |
| 6 | фізичне/хімічне знезараження | |
| 7 | іржавіння, корозія | |
| 8 | мул, осад | |
| 9 | лужність | |
| 10 | органічні кислоти | |

3. Complete the sentences with the words and word combinations given below and then translate those ones into Ukrainian

sludge, high-water content, poor lubrication, to emulsify, coolers, crankcase, proliferation, self-regulating mechanism, emulsification, microbial contamination

1. The system stabilizes diesel and bio-fuels and eliminates ... to optimize and maintain fuel quality. 2. Researchers and manufacturers agree that the primary cause of friction and mechanical wear is 3. Ultrasonication is a very effective method of the dispersion of solids and ... of liquids. 4. A large amount of ... remaining on the ground after the river leaves the banks is a useful natural

fertilizer. 5. The most striking characteristic of the Neolithic in Ireland was the sudden appearance and dramatic ... of megalithic monuments. 6. Corporate social responsibility in the company functions as a built-in, ... that allows control and provide support for the law, and ethical and international norms. 7. With its aluminium ..., the new four-cylinder engine weighs just over 100 kilograms, despite its highly complex technology package. 8. Evaporation applies when creating ... for engines and nuclear reactors. 9. Earth stands out from the planets because of its ..., which many scientists suspect contributed to the evolution of life. 10. Phosphates and citric acid salts are added to stabilize and ..., to regulate the acidity of the product.

4. Translate the following sentences into English using the words and word combinations below

friction forces, electricity, plugging, chemical weapons decontamination, physical exertion, manufacturers, evaporation, nutrients, a purifier, piston rings

1. Поршні та поршневі кільця, виготовлені з високою точністю, забезпечують оптимізоване споживання палива з максимальною потужністю. 2. Високий вміст цукрів і органічних кислот сприяє швидкому відновленню після фізичних навантажень. 3. Армія США оголосила, що активізує розробку швидкодіючої технології розпилення для дезактивації хімічної зброї. 4. Новий експеримент дозволяє краще зрозуміти природу сил тертя на мікроскопічному рівні. 5. У Бельгії діють сім ядерних реакторів, які виробляють близько половини електроенергії країни. 6. Випаровування відбувається не лише з поверхні океану і суші, але і в атмосфер, де пари води постійно конденсуються і знову випаровуються. 7. Будь-яку транзакцію можна перевірити, підключивши підпис і відкритий ключ до криптовалютного гаманця. 8. Вітаміни та поживні речовини є критично важливими для вашої дитини. 9. Перший крок, який ви маєте зробити, це пити достатню кількість води, оскільки вона діє як природний очисник. 10. Японські виробники подбали про те, щоб пасажери відчували себе максимально комфортно і безпечно.

5. Read the extract below, fill in the gaps with the missing definite or indefinite articles, and make 5 questions to the text

An important parameter for ... marine diesel engine is ... rating figure, usually stated as bhp or kW per cylinder at ... given rev/min.

Although engine builders talk of continuous service rating (csr) and maximum continuous rating (mcr), as well as overload ratings, ... rating which concerns ... shipowner most, is ... maximum output guaranteed by ... engine builder at which ... engine will operate continuously day in and day out. It is most important that ... engine be sold for operation at its true maximum rating and that ... correctly sized engine be installed in ... ship in ... first place; ...

under-rated main engine, or more particularly ... auxiliary, will inevitably be operated at its limits most of ... time. It is wrong for ... ship to be at ... mercy of two or three undersized and thus over-rated auxiliary engines, or ... main engine that needs to operate at its maximum continuous output to maintain ... desired service speed.

Prudent shipowners usually insist that ... engines be capable of maintaining ... desired service speed fully loaded when developing not more than 80 per cent (or some other percentage) of their rated brake horsepower. However, such ... stipulation can leave ... full-rated power undefined and therefore does not necessarily ensure ... satisfactory moderate continuous rating, hence ... appearance of continuous service rating and maximum continuous rating. The former is ... moderate in-service figure, ... latter is ... engine builder's set point of mean pressures and revolutions that ... engines can carry continuously.

Normally ... ship will run sea trials to meet the contract trials speed (at ... sufficient margin above ... required service speed) and ... continuous service rating should be applied when ... vessel is in service. It is not unknown for shipowners to then stipulate that ... upper power level of ... engines in service should be somewhere between 85–100 per cent of ... service speed output, which could be as much as 20 per cent less than ... engine maker's guaranteed maximum continuous rating.

6. Translate the text from task 1 into Ukrainian.

References

- Anderson, J. D. Jr. (2017). *Fundamentals of Aerodynamics*. McGraw-Hill Education.
- Anderson, R. J. (2008). *Security Engineering: A Guide to Building Dependable Distributed Systems*. Wiley Publishing, Inc.
- Hamming, R. W. (2005). *The Art of Doing Science and Engineering. Learning to Learn*. Gordon and Breach Science Publishers.
- Soler, M. (2014). *Fundamentals of Aerospace Engineering*. An introductory course to aeronautical engineering. Create Space.
- Systems Engineering Fundamentals*. (2013). United States Government US Army. CreateSpace Independent Publishing Platform.
- Treatment of Nuclear and Radiological Casualties: Fm 4-02.283*. (2012). CreateSpace
- Woodyard, D. (2004). *Pounder's Marine Diesel Engines and Gas Turbines*. Replika Press Pvt. Ltd.

НАВЧАЛЬНЕ ВИДАННЯ

Укладачі:

Безруков Андрій Вікторович

канд. філол. наук, доцент

Боговиц Оксана Дурелівна

канд. філол. наук, доцент

ВИРОБНИЧА ПРАКТИКА

Методичні рекомендації для набуття навичок роботи
за спеціальністю 035 Філологія,
спеціалізацією 035.041 Германські мови та літератури
(переклад включно), перша – англійська

Формат 60×84/16. Папір офсетний.
Ум. друк. арк. 4,4. Зам. № 469
Видавництво: ПП Вахмістров О.Є.
Адреса видавництва та друкарні:
49000, м. Дніпро, вул. Писаржевського, 18
Тел. 063 359 83 09
Ел. адреса: 8102@uk.net
Наклад 50 прим.