



ECAR ENGINEERING CENTRE

Modular training program «Engineering Center Management School»

Catalogue of module «DEVELOPMENT MANAGEMENT»

Training list:

- Organization of the product development and modification process: application of foreign experience in a Russian company (3 days training)
- Modern approaches and practical experience in product configuration management (4 days training)
- Practical methods for effective construction of 3D models and work with a product digital mockup based on European experience (3 days training with practice in CAD)

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JSC ENGINEERING CENTER ECAR

Seminar program:

**"Organization of the product development and modification process:
application of foreign experience in a Russian company"**

MOSCOW



JSC ENGINEERING CENTER ECAR

" Organization of the product development and modification process: application of foreign experience in a Russian company "

1. SEMINAR PURPOSE:

- ✓ To acquaint attendees with the process of developing a new product from the stage of forming a design and layout scheme to the certification stage.

2. TARGET AUDIENCE:

The seminar is meant for managers and specialists of design bureaus, design and engineering departments of various mechanical engineering companies related to the development and modification of mechanical engineering products, production support and certification, as well as for managers and specialists of departments for the development of the production system involved in operational efficiency improvement projects.

3. SEMINAR CHARACTERISTICS:

- ✓ The duration of the seminar – 24 acad. hours (3 days);
- ✓ Seminar timing – from 10.00 to 17.15;
- ✓ Breaks: two coffee breaks and lunch.

4. SEMINAR DESCRIPTION:

- ✓ During the seminar, attendees will get acquainted with the unique practical experience and gain systematic knowledge about foreign approaches to the organization of engineering work at all stages of the product life cycle from the engineering center specialists of the leading European aircraft corporation;
- ✓ The program, built on the principle "from theory to practice", will allow participants to master the material in a short time, and then use it in practice successfully.

5. CRITERIA FOR SUCCESSFUL SEMINAR COMPLETION:

- ✓ Attendees must have at least 3 years of design and engineering work experience (including digital mock-up) in design departments of mechanical engineering companies;
- ✓ Compliance with the timing, rules of participation in the seminar;
- ✓ Initiative behavior of attendees;
- ✓ An open form of discussion of issues under consideration.

6. SEMINAR OUTPUT:

The attendee receives theoretical knowledge about the organization of the product development and modification process: the application of foreign experience of design processes in a Russian company. The attendee studies examples from the work of the engineering center on this topic.

7. SEMINAR CONDITIONS:

- ✓ The possibility of conducting classes using teaching aids (computer or laptop, projector, screen, blackboard, etc.);



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- ✓ The ability to work under normal lighting conditions and in ventilated classrooms;
- ✓ The ability to freely use sanitary facilities and break areas;
- ✓ The seminar can only be held in a face-to-face format.

Handout materials issued to attendees:

- ✓ Seminar training program;
- ✓ Seminar handout material (for educational purposes).

8. SEMINAR SCHEDULE:

Day 1

Topic No.	Topic name	Time, hour
1	Registration of attendees. Presentation of the lecturer. Information about JSC ECAR. The rules of the seminar.	09.30–10.00
2	JSC ECAR is an engineering center of the leading aircraft corporation: - Major achievements; - Types of products manufactured. Airworthiness and certification: - Developer, manufacturer, and product certification; - Certification bodies. Certification basis; - Types of certification in the development stage.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Aircraft modification system: - Set of modifications; - Certification of changes. Practice: examples of a system of aircraft modifications and levels of changes on the example of projects carried out in JSC ECAR.	11.45–13.15
Break (lunch)		13.15–14.00
4	Serial design activity. Modification process of the developed product: - Levels of changes.	14.00–15.20
Break (coffee break)		15.20–15.30
5	The process of the developed product modification: - Stages of implementation; - Documentation.	15.30–16.45
6	Questions and answers.	16.45–17.15



Day 2

Topic No.	Topic name	Time, hour
1	Requirements for the aircraft design. General principles of the design process of the leading European aircraft manufacturer.	10.00–11.30
Break (coffee break)		11.30–11.45
2	The stage of conceptual (sketch and technical) design: <ul style="list-style-type: none"> - Stages of new product development, key events, design based on alternatives; - Engineering documentation at the stages of preliminary and sketch design: the basis for the development of basic structure and systems. 3D, 2D, product structure; - Master Geometry (MG); - Draft projects (DP). 	11.45–13.15
Break (lunch)		13.15–14.00
3	The stage of conceptual (sketch and technical) design: <ul style="list-style-type: none"> - Basic drawings of tolerances and drawings of junctions (Frontier and Interface Drawings); - Sketch digital mock-up SAM (Space Allocation Mock-Up); - Rules for collaboration of several performers in a single digital mock-up; - Ensuring product alignment in a case of development division between several design bureaus or remote divisions of one design bureau. Practice: Demonstrate standard examples of digital mock-ups at various stages of the product life cycle, demonstrate standard documents used in the work process.	14.00–15.20
Break (coffee break)		15.20–15.30
4	Unity of design and production processes: <ul style="list-style-type: none"> - The uniform structure of the product; - 3D as a reference base; - Standardization of elements, materials, and production processes. 	15.30–16.45
5	Questions and answers.	16.45–17.15

**Day 3**

Topic No.	Topic name	Time, hour
1	Detailed design: <ul style="list-style-type: none">- Working digital mock-up GRM (Geometry Reference Mock-Up);- Design Data Set;- Standardization of elements, materials, and production processes.	10.00–11.30
Break (coffee break)		11.30–11.45
2	Naming and numbering. Inconsistencies in design and production supplies. Ways of solution: <ul style="list-style-type: none">- Errors of design bureau;- Errors in production.	11.45–13.15
Break (lunch)		13.15–14.00
3	The system for checking and ensuring the quality of design supplies. The system of organization of signatures for technical documentation: <ul style="list-style-type: none">- Participants of the process;- Documents of the process.	14.00–15.20
Break (coffee break)		15.20–15.30
4	The work of the strength department during product development. Customer support after product delivery: <ul style="list-style-type: none">- Repair Manual;- Inspection during operation;- Service bulletins.	15.30–16.45
5	Questions and answers. Summing-up and certificate issuing.	16.45–17.15



JSC ENGINEERING CENTER ECAR

Seminar program:

"Modern approaches and practical experience in product configuration management"

MOSCOW



JSC ENGINEERING CENTER ECAR

" Modern approaches and practical experience in product configuration management "

1. SEMINAR PURPOSE:

- ✓ To acquaint participants with the unique practical experience and give system knowledge in the application of the configuration management system from the engineering center specialists of the leading European aircraft corporation;
- ✓ To acquaint attendees with examples of the practical application of the configuration management system at all stages of the product lifecycle.

2. TARGET AUDIENCE:

The seminar is meant for managers and specialists of design bureaus, design and engineering departments of various mechanical engineering companies related to the development and modification of structures, production support and certification.

3. SEMINAR CHARACTERISTICS:

- ✓ The duration of the seminar – 32 acad. hours (4 days);
- ✓ Seminar timing – from 10.00 to 17.15;
- ✓ Breaks: two coffee breaks and lunch.

4. SEMINAR DESCRIPTION:

- ✓ During the seminar, attendees will get acquainted with modern approaches and practical experience in product configuration management, and will study in detail the process of changes during the product life cycle;
- ✓ The program, built on the principle "from theory to practice", will allow attendees to master the material in a short time and then successfully use it in practice.

5. CRITERIA FOR SUCCESSFUL SEMINAR COMPLETION:

- ✓ Basic knowledge of applicability and principles of configuration management;
- ✓ Compliance with the timing, rules of participation in the seminar;
- ✓ Initiative behavior of attendees;
- ✓ An open form of discussion of issues under consideration.

6. SEMINAR OUTPUT:

Attendees will gain theoretical knowledge about modern approaches to product configuration management and acquire practical skills on this topic.

7. SEMINAR CONDITIONS:

- ✓ The possibility of conducting classes using teaching aids (computer or laptop, projector, screen, blackboard, etc.);
- ✓ The ability to work under normal lighting conditions and in ventilated classrooms;
- ✓ The ability to freely use sanitary facilities and break areas;
- ✓ The seminar can only be held in a face-to-face format.

Handout materials issued to attendees:

- ✓ Seminar training program;
- ✓ Seminar handout material (for educational purposes).



8 SEMINAR SCHEDULE:

Day 1

Topic No.	Topic name	Time, hour
1	Registration of attendees. Presentation of the lecturer. Information about JSC ECAR. The rules of the seminar.	09.30–10.00
2	Definition of configuration management. Examples of the use of configuration management in various industries.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Overview of international standards in configuration management. Standards in aircraft configuration management applied in JSC ECAR.	11.45–13.15
Break (lunch)		13.15–14.00
4	Product lifecycle (aircraft): <ul style="list-style-type: none"> - Contract; - Product Specification; - Product Description; - Preparation and launch; - Assembly and check; - Validation and delivery; - Certification; - Support and maintenance. 	14.00–15.20
Break (coffee break)		15.20–15.30
5	Product offer management at the level of contract: <ul style="list-style-type: none"> - The standard specification. System of catalogues: <ul style="list-style-type: none"> - Additional options. 	15.30–16.45
6	Questions and answers.	16.45–17.15

Day 2

Topic No.	Topic name	Time, hour
1	Registration of attendees.	09.30–10.00



Topic No.	Topic name	Time, hour
2	Creation of specifications: preliminary product structure and catalogues. The process of change during the product life cycle (aircraft): - The process of technical changes; - The modification process. The concept of modifications: - Types of modifications; - Categories of modifications.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Processes of analysis and implementation of changes at the stages of design definition and release of detailed design documentation: - Commencement; - Evaluation; - Analysis; - Implementation.	11.45–13.15
Break (lunch)		13.15–14.00
4	Package of engineering documentation. The transition from the product specification to the product description through the package of engineering documentation at the stage of design definition and detailed design documentation release.	14.00–15.20
Break (coffee break)		15.20–15.30
5	Practice: - Description of the product and formation of its offer at the level of a contract; - CA Breakdown; - Description of modification and TRS creation.	15.30–16.45
6	Questions and answers.	16.45–17.15

Day 3

Topic No.	Topic name	Time, hour
1	Registration of attendees.	09.30–10.00
2	Clarification of the product structure when switching to detailed design documentation creation.	10.00–11.30
Break (coffee break)		11.30–11.45



Topic No.	Topic name	Time, hour
3	Connection of the configuration element and the specific technical solution (CI-LO-DS concept): <ul style="list-style-type: none"> - Configuration item; - Linking object; - Design solution. 	11.45–13.15
Break (lunch)		13.15–14.00
4	Combinations of changes: <ul style="list-style-type: none"> - Link to the engineering documentation package; - Applicability of modifications. Various stages of changes and their impact on production and certification.	14.00-15.20
Break (coffee break)		15.20–15.30
5	Practice: <ul style="list-style-type: none"> - Working out the creation of the product structure with the subsequent implementation of changes; - Practical application of CI-LO-DS concept and modification system. 	15.30–16.45
6	Questions and answers.	16.45-17.15

Day 4

Topic No.	Topic name	Time, hour
1	Registration of attendees.	09.30–10.00
2	Preparation and start-up of production. Document management at the production. Manufacturing of the product (aircraft) and its verification.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Different types of inconsistencies and the process of handling them: <ul style="list-style-type: none"> - Factory request for a construction change; - Design bureau request for a construction change; - Concessions (production errors). 	11.45–13.15
Break (lunch)		13.15–14.00
4	Confirmation of the product compliance with the specified configuration and transfer to the customer: <ul style="list-style-type: none"> - Stages; - Roles. Certification process: the main significant points.	14.00-15.20
Break (coffee break)		15.20–15.30



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Topic No.	Topic name	Time, hour
5	Further support of the product (aircraft) during operation: - The introduction of options from the catalogue; - Product repair; - Rework under specific requests of airlines; - Rework under new security requirements.	15.30–16.45
6	Questions and answers. Certificates issuing.	16.45–17.15



JSC ENGINEERING CENTER ECAR

Seminar program:

"Practical methods for effective construction of 3D models and work with a product digital mockup based on European experience"

MOSCOW



1. SEMINAR PURPOSE:

To introduce attendees to the organization of building an effective work with 3D models and digital mock-up of a product, to determine methods and ways of creating an effective work process.

2. TARGET AUDIENCE:

- ✓ The seminar is intended for engineers working in various CAD systems who want to improve their skills in 3D modeling and design, improve their work efficiency, expand their horizons, as well as for specialists of design bureaus of mechanical engineering companies involved in the formation and maintenance of digital mock-up (DMU) updating processes; for specialists ensuring the quality of product mock-up at different stages of the life cycle;
- ✓ This seminar is useful for engineers of aviation and other branches of mechanical engineering, where CAD systems are used.

3. SEMINAR CHARACTERISTICS:

- ✓ The duration of the seminar – 24 acad. hours (3 days);
- ✓ Seminar timing – from 10.00 to 17.15;
- ✓ Breaks: two coffee breaks and lunch.

4. SEMINAR DESCRIPTION:

- ✓ During the seminar, participants will get acquainted with the unique practical experience of JSC ECAR specialists in 3D modeling and product development using an updated digital mock-up, created in the process of work with the largest European civil aircraft manufacturer;
- ✓ The program, built on the principle "from theory to practice", will allow you to master the material in a short time and then successfully use it in practice;
- ✓ The program of the seminar is developed on the example of CATIA. It is possible to adapt the training for other CAD systems.

5. CRITERIA FOR SUCCESSFUL SEMINAR COMPLETION:

- ✓ Attendees should be advanced users of CAD systems;
- ✓ Compliance with the timing, rules of participation in the seminar;
- ✓ Initiative behavior of attendees;
- ✓ An open form of discussion of issues under consideration.

6. SEMINAR OUTPUT:

Attendees gain theoretical knowledge about methods of effective 3D modeling and work with digital mock-up of a product, acquire practical skills for successful work on this topic.

7. SEMINAR CONDITIONS:

- ✓ The possibility of conducting classes using teaching aids (computer or laptop, projector, screen, blackboard, etc.);
- ✓ The ability to work under normal lighting conditions and in ventilated classrooms;
- ✓ The ability to freely use sanitary facilities and break areas;
- ✓ The seminar can only be held in a face-to-face format.

Handout materials issued to attendees:

- ✓ Seminar training program;

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- ✓ Seminar handout material (for educational purposes).

8. SEMINAR SCHEDULE:**Day 1**

Topic No.	Topic name	Time, hour
1	Registration of attendees. Presentation of the lecturer. Information about JSC ECAR. The rules of the seminar.	09.30–10.00
2	The main stages of designing a new product; "completeness" criteria and requirements for 3D at each stage.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Reference documentation system: main technical documents used in the design process. Basic requirements for milled and sheet metal parts; rules for designing such parts.	11.45–13.15
Break (lunch)		13.15–14.00
4	Principles of effective 3D modeling: - selecting a base surface / base sketch for complex parts; - rational sizing in sketches; - boolean operations, requirements for the construction tree; - the use of Publication for creating symmetrical parts and parts from preforms.	14.00–15.20
Break (coffee break)		15.20–15.30



Topic No.	Topic name	Time, hour
5	Principles of effective 3D modeling: - condition of supply; - integration of flexible elements in assemblies (e.g. hose-pipes); - modeling of fasteners in large assemblies to increase performance, HnF module, creating CPL; - a base of tools used in production. Practice: production of sheet and milled parts using effective approaches and methods of 3D modeling.	15.30–16.45
6	Questions and answers.	16.45-17.15

Day 2

Topic No.	Topic name	Time, hour
1	Attendee registration.	09.30–10.00
2	FULL 3D and its interactive application in production.	10.00–11.30
Break (coffee break)		11.30–11.45
2	Special features of CAD systems (with examples of their application): - parameterization and application of VBA for 3D modeling; - checking orthogonality of fasteners; - setting 2D fastener symbols on a drawing sheet; Practice: - analysis of various parts and discussion of ways to build them using CAD systems; - analysis of examples of using parameterization and VBA; - analysis of examples of structural partitioning of the product.	11.45–13.15
Break (lunch)		13.15–14.00
3	Additive technologies and topology optimization. 3D mock-up visualizer: TreND v5.	14.00-15.20
Break (coffee break)		15.20–15.30
4	Acquaintance with the structure of product partitioning. Product configuration control elements used when creating a digital mock-up.	15.30–16.45
5	Questions and answers.	16.45–17.15



Day 3

Topic No.	Topic name	Time, hour
1	Attendee registration.	09.30–10.00
2	Development of a new product or development of a new modification: - Description of design maturity requirements - Mat A, B, C; - Planning and monitoring the design evolution using digital mock-up. 3D mock-up maturity control points (DMU gates). The practical task for determining the degree of 3D mock-up maturity.	10.00–11.30
Break (coffee break)		11.30–11.45
3	Development of a new product or development of a new modification: - Approaches to product quality control through digital mock-up on the example of database with problem areas (ADB tool).	11.45–13.15
Break (lunch)		13.15–14.00
4	Interface management between design bureau departments (Interface point management (IPM))	14.00-15.20
Break (coffee break)		15.20–15.30
5	Integration of after-market modifications using a 3D mock-up. Main approaches.	15.30–16.45
6	Questions and answers. Certificates issuing.	16.45-17.15