



**Complex electronic systems design tool**

**“dBricks”**

**Use case examples.**

**dBr.0004.02**

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## 1 Revision sheet

Rev.	Date	Description	Amended by
01.en01	16.10.2016	First release.	Sinitsyn V.
02	17.05.2021	Company and product logo update	

## 2 Acronyms and definitions list

Acronym/definition	Description
A/C	Aircraft
ARINC	Aeronautical Radio, Incorporated –provider of aeronautical standards. In this document ARINC XXX refers to specific standard
EMI	Electro-magnetic interference
ICD	Interface Control Document
I/O	Input/ Output
SW	Software

### 3 Introduction

In every company which works on development or modernization of complex electronic systems, such as aircraft avionics, there are several groups of potential dBricks tool users. Each of these groups faces different challenges and has different requirements for process improvement. It is obvious that in every particular company some of group functions may be merged or outsourced to sub-contractors but duties of these groups should be done anyway

1. System design groups (e.g. avionics navigation, avionics indication, flight control, landing gear, fuel, hydraulic etc.);
2. Equipment functionality design sub-groups (e.g. display requirement designers etc.);
3. Wiring schematics design group;
4. A/C wiring design group;
5. Interface control documents design group;
6. SW design group;
7. Test bench group.

### 4 System design groups

#### 4.1 Description

These guys are focused on their system behavior. They define top-level requirements, prepare lists of i/o parameters, import COTS transport layer data, make first-approach wiring and prepare source data for further design by equipment-level function design teams, ICD teams, wiring teams etc. It does not mean they won't do anything from that time. It means they are focusing on top-level design and testing

#### 4.2 Duties

1. Handling top-level requirements;
2. Low level design checks;
3. Functional system testing.

#### 4.3 Automated processes

1. Data handling and data consistency checks;
2. Data transfer to/from other groups;
3. Test cases generation (I/O configuration).

#### 4.4 dBricks usage advantages

1. Ease of data exchange between groups;
2. Data transparency.

### 5 Equipment functionality design sub-groups

#### 5.1 Description

Good examples of such groups are PFD display group or flight management application group. Their task is to make specifications for further use by SW team. Main advantage of using dBricks for them is focusing on functionality not equipment interface planning. They can specify their inputs and outputs in form of function parameters. Later ICD team is to add transport layer details, find source for inputs etc. SW guys will receive entire package (functional specification and interface details) and both parts will match each other 100%

#### 5.2 Duties

1. Functional specification design.

### **5.3 Automated processes**

1. Interface specification design.

### **5.4 dBricks usage advantages**

1. No need to check whether everything is ok with ICD;
2. Transparency of parameters path.

## **6 Wiring schematics design group**

### **6.1 Description**

Most of equipment manufacturers are supplying airframe designers with wiring details data in form of wiring schematics. Wiring design groups normally do their job with aid of tools they got used to like AutoCAD, MS Visio etc. dBricks helps them to reduce workload by making such diagrams automatically based on data introduced by other groups.

### **6.2 Duties**

1. Wiring schematics design;
2. Mating connectors selection.

### **6.3 Automated processes**

1. Structural and wiring schematics generation.

### **6.4 dBricks usage advantages**

1. No need to keep hand on system design guys activities: all changes are traced automatically;
2. Less mistakes of transferring data from suppliers documents to various documents. Any change or mistake is to be changed only once;
3. No more need of making drawings: documents are generated automatically.

## **7 A/C wiring design group**

### **7.1 Description**

Making a/c wiring is a challenging task. Every action you have to do with a/c wiring is easy on its own. But you have thousands of things to be done! And everything should be made consistent. Here are some challenging things about a/c wiring: EMI restrictions, physical damage restrictions, section break-out, ease of production, weight decrease, material management etc...

### **7.2 Duties**

1. Wiring design documents;
2. Harness manufacturing documents;
3. Material management planning;
4. Safety restriction analysis.

### **7.3 Automated processes**

1. Wiring design documents generation;
2. Wiring harness documents generation;
3. Material lists generation;
4. Certification requirements compliance analysis.

### **7.4 dBricks usage advantages**

1. Using dBricks helps to reduce vast process of A/C wiring design to set of simple operations;

2. Common database used guarantees consistency of final result.

## **8 Interface control documents design group**

### **8.1 Description**

ICD design team is one of major users of the tool. Their need for efficient handling of huge numbers of parameters results in 99% probability of introducing any tools even self-made ones (e.g. Excel script or MS Access data bases). Unfortunately results of their work in that case cannot be used by other teams. Using specialized tool increase ICD team work quality and improves their quality of live. Basic features valuable for them are: Bulk import feature, consistency and error checks and automated ICD generation

In some projects this team is also responsible for data concentrator application configuring and checking whether all DCA outputs are supported by relevant inputs.

### **8.2 Duties**

1. Making transport-layer ICD of various nature: ARINC 429, ARINC 825, ARINC 664, discrete signals, analog signals, etc.;
2. Configuring gateways like data concentrator applications.

### **8.3 Automated processes**

1. Transport layer data handling;
2. Consistency checks and updates (Including gateway configuration);
3. Document generation;
4. DCA requirements for further use by SW people.

### **8.4 dBricks usage advantages**

1. Labor input decrease;
2. Consistency guaranty;
3. No need to check generated data.

## **9 Software design group**

### **9.1 Description**

Software design group do their work based on huge data packages. These data packages include all aspects of software functioning starting from functions description to data flows mapping data. That data is usually supplied in a form which is not very convenient for further use. Using dBricks allows streamlining this work by generating data packages in any form needed for the group.

### **9.2 Duties**

1. Software design;
2. Software testing;
3. Relevant documents development.

### **9.3 Automated processes**

1. List of inputs and outputs of SW is now part of data package they receive with specification;
2. Generation of I/O configuration (e.g. ARINC 429) can be automated with their tools;
3. I/O configuration of test benches can also be automated.

### **9.4 dBricks usage advantages**

1. Explicit and consistent data for their IO configurators and benches.

## **10 Test bench design group**

### **10.1 Description**

Test bench group main task is to build and maintain test benches for various equipment testing. Normally the group receives all data from other groups and makes following things:

- Develops wiring documentation for initial manufacturing and further update (as a/c wiring changes);
- Develops simulation systems, models and simulators, sets up testing environment;
- Supports tests.

Making wiring is quite bulky job. Normally for “Electronic bird” –size benches we have thousands or even tenth of thousands wires. Even more bulky job is to support wiring updates. As changes are made because of different reasons (e.g. a/c wiring update, hot-fix, proof-of-concept changes) and because of number of changes (thousands) managing wires without tools is practically impossible. So I would say tools are needed even if a/c wiring designers do not use them.

Developing of models, simulators and test environment is 10% architecture planning 20% model development and 70% configuration files design. When you have proper tools like dBricks, you can use data introduced by ICD group as source data for development of our models. In that case all intra-model communication and I/O format for a/c interfaces is made 95% automatically.

For test support you always need fast and handy way for getting design data. dBricks also helps with it.

### **10.2 Duties**

1. Rig wiring documents design;
2. Rig wiring update documents design;
3. Model and simulator development.

### **10.3 Automated processes**

1. Wiring initial manufacturing documents design;
2. Wiring update manufacturing documents design;
3. Simulation system configuration files design.

### **10.4 dBricks usage advantages**

1. Outstanding decrease of labor input;
2. Outstanding improvement of resulting documents quality.