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Dedicated to the 150th Anniversary and
The 1st Congress of World Engineers and
Riga Polytechnical Institute / RTU Alumni

## DIGEST

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# Assessment of Aircraft Crew Skills Development Dynamics by Means of a Separate Exercise Results

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***Key words*** **– learning curve, flight evaluation, progress evaluation.**

## I. INTRODUCTION

It is recognized that the skills of the operator performance due to interactive learning and exercises develop by large exponentially from the initial level until required level with the negative degree coefficient.

The skills development dynamics of a particular aircraft crew are influenced by many factors and the possible precise identification of this correlation creates a chance to optimize and individualize the learning process.

In order to obtain skills dynamics parameters several consecutive measurements of the successful exercise fulfillment are necessary. These measurements are not possible to acquire reliably by means of a one summary exercise assessment since this is usually formed by small differentiation 4-5 grading system (from 2 to 5 with possible "between" mark 3 minus or 2.5) and deals with absolute security level not with the progress of the skills development.

## II. ASSESSMENT METHODS

For the more precise identification of the aircraft crew skills dynamics the following methods are proposed:

- For the exercise progress assessment partial evaluation should be used:
  - About the keeping of the flight parameters within defined diapasons;
  - About the operations with the systems (turning on, turning off);
  - About the decision making in each exercise step;
- The emphasis should be put on the more important flight steps (uniting similar ones) and in each step the parameters should be classified by their importance into 3 groups:
  - 1. group – the aim of the step is to reach the value of the parameter (emphasis – 4);
  - 2. group- the parameter directly influences the parameters of the 1.group (emphasis – 2);
  - 3. group – the parameter is evaluated but it is not included in 1. group or 2.group (emphasis – 1).
- In accordance with the grading linguistic meaning:
  - Partial mark "**5**" means – "the aim is fully realized" – therefore successes level for following particular parameter, operation or decision is 100%.
  - Partial mark "**2**" – the aim is not achieved - success 0%.
  - Partial mark "**3**" – 'average', 'good enough' – success ≈ 50%
  - Partial mark „**4**" – 'good', 'above average', 'normally' - success ≈ 80%
  - Partial mark "**2.5**" – 'below average , but not complete failure' - success ≈ 25-30%
- The impact of the marks on progress assessment can be quite precisely described by the approximation (1), (fig. 1), that shows approximately 1.5 times larger impact of the negative marks;

$$Progr(Mark) = 142.1 - 42.1 \cdot 1.5^{(5-Mark)} \quad (1)$$

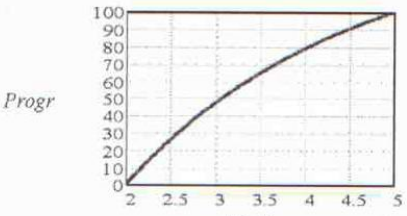


Fig. 1. Success in accordance with the linguistic meaning of marking

- The assessment of the exercise results progress should be calculated by summing up partial assessments and by taking note of their emphasis and 1.5 times larger impact of the negative marks (2):

$$Mark_k = \frac{\sum_{i=1}^{n} (Mark_i \cdot 1.5^{(5-Mark_i)} \cdot MCount_i)}{\sum_{i=1}^{n} (1.5^{(5-Mark_i)} \cdot MCount_i)} \quad (2)$$

where:

$Mark_i$ – particular partial mark ;

$n$ – number of the different grades, marks;

$MCount_i$ – number of marks of the particular $Mark_i$ grade.

- In accordance with (2) the resulting mark of the piloting in each step is acquired, then the resulting mark of the piloting for the whole exercise (n - number of steps), and then of the discreet operations and the decision making (uniting all partial marks) and finally of the whole exercise in total;
- Learning curve are generated by formula (3):

$$Progr(flight) = 100 - (100 - Progr_0)e^{-Ac \cdot flight} \quad (3)$$

where:

$Progr_0$ – initial level of the progress (learning);

$Ac$ – learning speed constant (individual for the crew);

$flight$ – serial number of the exercise (usually flight in circle).

The parameters $Ac$ and $Progr_0$ are obtained by processing the exercise results marks using Gauss method.

## III. CONCLUSION

It is advised to form the final assessment about learning steps not only from the assessment obtained in the final control exercise, but also to take into the consideration the marks of the previous exercises. It is proposed to use a linear assessment of the previous exercises impact correlation and to take into account from 1 up to 7 previous exercises.