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PEER REVIEW

Experience of involving young researchers in reviewing manuscripts submitted to a scientific journal

D. Yu. Bolshakov
Almaz – Antey Air and Space Defence Corporation, Moscow, Russian Federation
e-mail: press@almaz-antey.ru

Abstract: This article describes the work of the Editorial Board of the *Journal of "Almaz – Antey" Air and Space Defence Corporation* during the period 2013–2020. The aim of this study was to evaluate the expediency of involving young researchers (aged below 40 years old) in peer-reviewing manuscripts submitted to the journal, as well as to analyse the quality of their work. It is shown that young researchers conduct reviews with a sufficient level of quality and in a timely manner. An analysis of 642 reviews allowed a dependence of the average review time by scientists up to 40 and those older than 40 years to be constructed. As a result, the expediency of attracting young researchers as reviewers was confirmed, since both the quality of the work and the peer-review time was comparable for young and experienced researchers.

Keywords: peer-reviewing, reviewer, young researcher, editorial board, scientific and technical journal, publication process, submission flow, average review time

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РЕЦЕНЗИРОВАНИЕ

Опыт привлечения молодых ученых в качестве рецензентов в научно-технический журнал

Д. Ю. Большаков
Концерн воздушно-космической обороны «Алмаз – Антей», г. Москва, Российская Федерация
e-mail: press@almaz-antey.ru

Резюме: Проведен анализ работы редакционной коллегии научно-технического журнала «Вестник Концерна ВКО "Алмаз – Антей"» за 2013–2020 гг. Цель исследования – оценить возможности и целесообразность подключения к рецензированию научных статей ученых в возрасте до 40 лет, а также качество работы этих ученых как рецензентов. Показано, что привлечение молодых ученых к этому процессу сохраняет качество и время рецензирования. На основании анализа 642 рецензий построена зависимость среднего времени рецензирования учеными моложе 40 лет и старше 40 лет. Результаты исследования подтвердили целесообразность привлечения к рецензированию молодых ученых, так как статистические характеристики времени рассмотрения статей практически совпадают, а качество их рецензий не уступает качеству заключений, сделанных учеными зрелого возраста.

Ключевые слова: рецензирование, рецензент, молодой ученый, редакционная коллегия, научно-технический журнал, прохождение рукописей, поток поступающих рукописей, среднее время рассмотрения

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Introduction

The Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation[1] has been published since 2009. Approximately 75 % of articles published from 2009 to 2019 are dedicated to Russian-made air defence and anti-missile defence systems [1].

The goal of the journal is to provide a platform for graduate students, researchers, applicants for scientific degrees, engineers, and heads of Russian and foreign universities, design bureaus of research institutes to publish scientific achievements in the field of aerodynamics, aircraft design, radio engineering and electronics within the equipment for AD and AMD systems and facilities [2].

Originally, the journal was exclusively intended for the publication of research results that were not meant for public media. However, in 2011, following the reasoned petition by the General Director of Almaz – Antey Air and Space Defence Corporation (hereinafter referred to as Corporation), the journal was included into the list of publications where the main results of doctoral and candidate theses are published (Higher Attestation Commission List) and started publishing articles released for public disclosure. The "restricted" journal continues to be published under the title of the Special Journal of "Almaz – Antey" Air and Space Defence Corporation and is issued once a year.

Since 2009, the journal was published 2 times a year, and since 2016 it has been published 4 times a year. The change in the publication frequency of the journal was propelled by the increased number of incoming articles. However, the number of published articles and the page count of the journal remained almost unchanged. On average, each issue contains 12 articles over 100 pages of the journal.

According to the Scientific Electronic Library (https://elibrary.ru/), the scientific disciplines of articles published in the journal have remained constant over the course of 8 years of its publication, while the top three categories and their order have not changed for several years (Fig. 1).

At the same time, the number of topics of the published articles has increased significantly. In the first years of publication, the journal primarily published the articles on radio engineering. In the last few years, the Space Research and Rocket Science section has been actively added to. The articles in this section are dedicated to gas and hydrodynamics, material resistance, continuum mechanics, jet engines, aerodynamics, and issues related to modelling of these processes. Articles on industrial management, metal processing, mechanical engineering, thermal physics, and continuum mechanics are submitted as well. Personalities and Events sections were intentionally added to the journal. For each discipline, there are more detailed topical sections, and there are specialists on the editorial board for reviewing manuscripts in any of them. Reviews are accepted in free form, and the editorial team forwards these reviews to the authors unchanged. At year end the most distinguished reviewers are commemorated by the General Director of the Corporation.

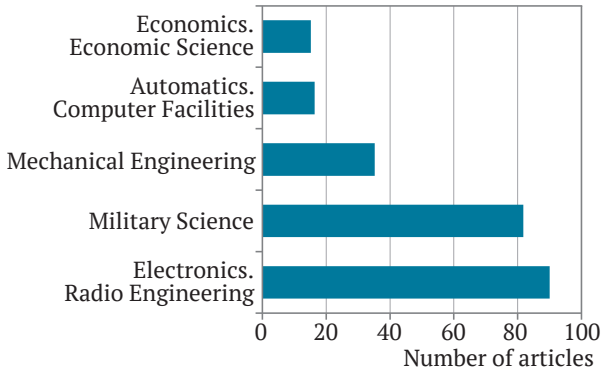

Fig. 1. *Distribution of the number of articles published in the Journal of "Almaz – Antey" Air and Space Defence Corporation over 2011 to 2020, by subject (according to the Russian Science Citation Index, RSCI)*

Since 2015, the issues of the journal have been posted on the Corporation's website in the public domain and indexed by search engines on the Internet. It should be noted that the rate of article downloads from the journal's website remains consistently high, and the total number of downloads has approached 20,000. Starting the same year, *e-mail* distribution was introduced, informing interested readers when the next issue of the journal is posted on the site. There are more than 1000 interested subscribers in the mailing list, and their number is increasing by approximately 100 subscriptions per year.

The editorial board of the journal is currently represented by 106 scientists from the Corporation enterprises and third-party organizations. Two of them are academicians of the RAS, one is a Corresponding Member of the RAS, and two are foreign scientists. The average age of industry specialists is 45 years with a normal distribution of ages relative to this value within the range from 20 to 70 years [3]. All members of the editorial board are reviewers of articles, and, conversely, a reviewer for us is always a member of the editorial board.

[1] Available at: http://journal.almaz-antey.ru/ [Accessed: 20.05.2020].

The need to search for new reviewers

The need to increase the membership of the editorial board is due to expansion in the number of incoming articles, as well as such additional intrinsic factors as the topical specifics of the journal, the accepted type of reviewing, and the territorial distribution of reviewers.

Topical specifics of the journal. The Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation publishes articles in 9 scientific specialisations.

The journal is the only one of its kind in Russia publishing the results of interdisciplinary research in the field of radio engineering and gas dynamics in conjunction with the study of materials and processes used in mechanical engineering for the design of complex systems of air and antimissile defence.

Review type. Since 2015, double-blind review has been introduced: an article with no indication of its authors is sent to the reviewer, the author is also not informed of the name of the reviewer. On average, there are 1.6 reviews per article, in other words, a significant part of the articles is reviewed by two reviewers [2].

Territorial distribution of reviewers. Since 2015, "extraterritorial" review has been practised, when an article from Moscow is sent to Ekaterinburg and Kazan, for instance, in order to avoid a hidden conflict of interests as well as the influence of the fact that the author and reviewer belong to the same school [2]. The percentage of manuscripts sent for evaluation to a reviewer geographically remote from the authors of the article averaged 77 % over the period from 2015 to 2020. Put in another way, almost 4 out of 5 articles are sent to be reviewed remotely from the author of the article.

All three of the factors listed above led the editorial team of the journal to the decision on the necessity of finding new reviewers.

Articles submission statistics

In 2017, the flow of articles submitted to the journal increased by 68 %, providing a heavy workload related to reviewing upon the editorial team [2]. The expanded portfolio led to a fourfold increase in the average time of reviewing a manuscript (from submission to the editorial office to the final decision) (Fig. 2).

In order to speed up the publishing process, in 2017 the editorial team decided to increase the number of reviewers and to involve more young scientists under the age of 40 in the evaluation of manuscripts (from 2009 to 2017 the number of such reviewers did not exceed 4 % of the total number of reviewers (Fig. 3)). It is worth noting that the experience of engaging young reviewers and analytical tools for comparative assessment of the quality of their work have not been previously studied, and the author was unable to find literary sources on this subject.

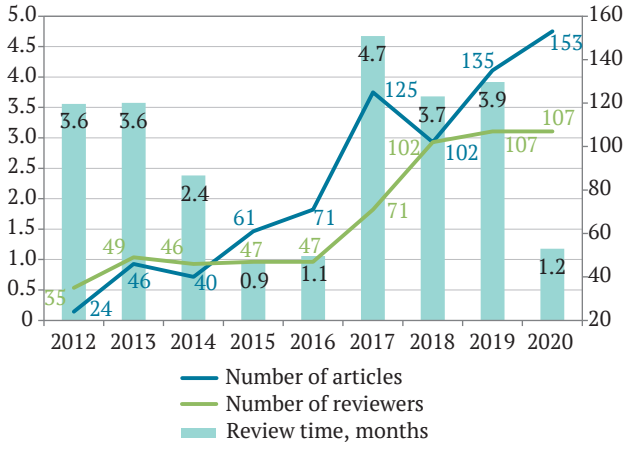

Fig. 2. *The average time of reviewing a manuscript by reviewers in 2012–2020 (data on the time of review is given for the first quarter of 2020, and the number of articles shows the predicted value at the end of 2020)*

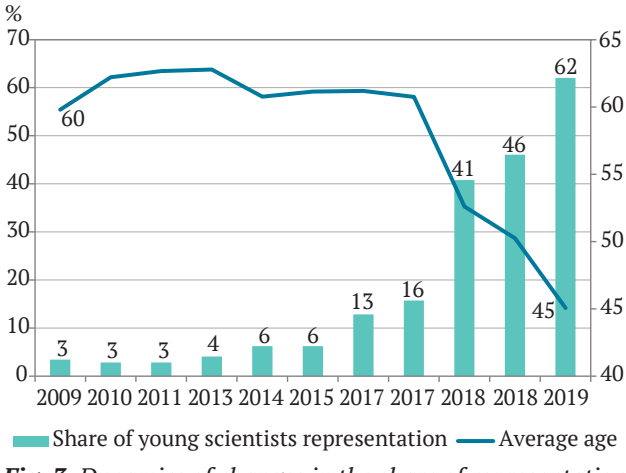

Fig. 3. *Dynamics of changes in the share of representation by scientists under the age of 40 in the editorial board of the journal of "Almaz – Antey" Air and Space Defence Corporation in 2009–2019*

The engagement of young scientists is caused by:

1) a small number of experts under the age of 40 (see Fig. 3 and 4, data for 2009);

2) the need to involve scientists under the age of 40 in the scientific activities of the Corporation enterprises;

3) the limited ability to evaluate a large number of articles by older reviewers due to their busy schedule and other major responsibilities.

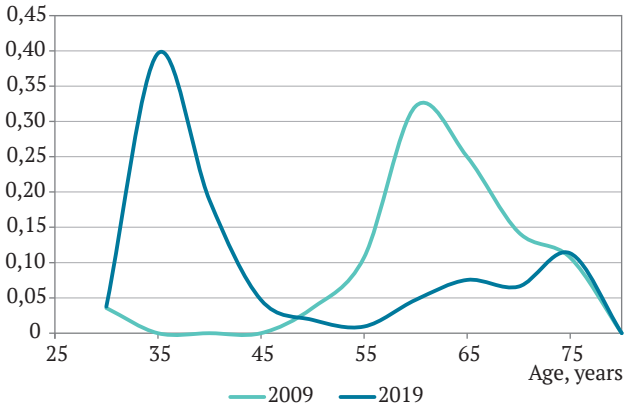

Fig. 4. *Normalized graph on the age of reviewers in 2009 and 2019*

As Fig. 4 shows, in 2009 the majority of reviewing work was carried out by scientists of the older generation (the average age was 60). That year, there were no reviewers in the age of 35–45. At the beginning of 2018, the editorial board already included 40 % of scientists under the age of 40 out of the total number of reviewers (Fig. 3). In 2019, the average age of reviewers was 45.

Expanding the number of reviewers in 2018 made it possible to reduce the time of articles review by 1 month (see Fig. 2, data for 2018).

In 2019, the number of manuscripts submitted to the journal reached a new maximum of 135 over the year, and it was decided to involve even more active scientists in the reviewing process. As a result, the number of scientists under 40 had reached 62 % with a total number of 106 reviewers by the end of 2019, making it possible to reduce the average time of reviewing a manuscript (from article submission to the editorial office to decision making) by almost 4 times (see Fig. 2, data for 2020) [2].

The graphs in Fig. 2 demonstrate that there is a non-linear relationship between the number of incoming articles, the number of reviewers, and the average time for consideration of manuscripts:

1) an increase in the number of incoming articles more than twofold in 2017 led to an increase in the time for their review more than fourfold due to the increased load on the existing board of reviewers;

2) an increase in the number of reviewers at the end of 2019 by 20 % led to an almost fourfold decrease in the time for articles review in the first quarter of 2020 (Fig. 2).

Methods of engaging reviewers

The Corporation as a vertically integrated structure includes approximately 60 enterprises: research institutes, design bureaus, and factories with research units. Such an outspread structure of the company is the reason why the editorial team mainly turns to subordinate organizations when looking for reviewers. There are several tools and sources for searching for reviewers:

1) sending ***letters of inquiry*** from the editorial board to subordinate enterprises with the request to name candidates from among young scientists;

2) involvement of the most robust scientists working both at the Corporation enterprises and in external organizations for reviewing through ***personal networking*** of the editorial board. Often, reviewers have business contacts with other scientists who conduct similar research. As a result of such networking, a reviewer is selected, as recommended by an acting reviewer;

3) an invitation to become reviewers of the journal given to the most vigorous ***authors*** of publications among graduate students and doctoral students of the Corporation enterprises and third-party organizations;

4) involvement of ambitious young scientists in reviewing, as well as scientists over 40 years old from similar research institutes and design bureaus.

Data on the results of engaging reviewers are given in Table 1.

Table 1

The results of engaging reviewers over the period from 2017 to 2020

Search tools and sources	Number of scientists engaged in reviewing	
	under 40	over 40
Letter of inquiry	59	31
Engaging the authors of articles	3	2
Personal networking	4	6
Associate organizations	0	2

As Table 1 shows, the most effective channel for engaging new reviewers for a vertically integrated structure is letters of inquiry sent to subordinate enterprises.

Quality control on reviews by scientists

Review quality. At the initial stage, manuscripts are simultaneously sent for review to a new reviewer (a young scientist) and to a reviewer over 40, who have no contact with each other. Quality control is carried out by the editorial team through comparison of the expert opinion of both reviewers. During all the time of working with young reviewers, the editorial team has not identified a single low-quality review. This is due to the number of reviewers (more than 100 people)

and their thematic focus, allowing for the article to be submitted to the appropriate subject matter expert for review. Withdrawals from reviewing in cases where the article was not on the subject matter of the reviewer amounted to no more than 5 %, so they can be neglected.

The relationship between the ratio of the number of reviewers under 40 to the number of scientists over 40 is shown in Fig. 5.

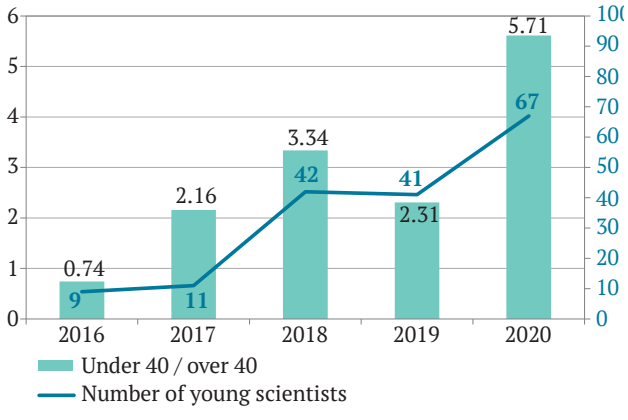

Fig. 5. *The ratio of the number of reviewers under 40 to the number of scientists over 40 and the dynamics of growth in the number of young scientists among reviewers in 2016–2020*

Fig. 5 shows that back in 2016, reviewers under 40 were less trusted than scientists over 40, however, this ratio more than doubled no later than 2017. A sharp increase in the share of reviews by young scientists in 2017 is due to the fact that several reviewers were appointed to an article in order to check the quality of the review: one scientist over 40 and several young ones. Since 2018, the share of reviews by young scientists has increased even more due to the increased number of reviewers under 40. In the first quarter of 2020, 62 % of reviewers were under 40, and the ratio of reviews by these two age groups was 6:1, in other words, there are 6 times more reviews prepared by young scientists than reviews performed by older scientists. *Such approach to the formation and use of the available pool of reviewers made it possible to reduce the average time of reviewing an article more than threefold* (Fig. 2).

Overall time for article reviews. The normalized values of the review time by scientists under 40 and over 40 are given in Fig. 6. The standard review duration in the Scientific and technical journal of "Almaz – Antey" Air and Space Defence Corporation is 2 weeks.

As Fig. 6 shows, the graphs of the distribution of the normalized review time by scientists under 40 and over 40 are close, but have some differences:

1. Scientists over 40 are 10 % more likely to review articles within a week than young scientists;
2. Scientists over 40 are 30 % less likely to review within the period of one to two weeks than young scientists;
3. On average, 75 % of all reviewers adhere to the two-week review period (79 % of young scientists, 74 % of scientists over 40);
4. For approximately 24 % of all reviewers (21 % of young scientists and 26 % of scientists over 40) it takes more than two weeks to write a review.

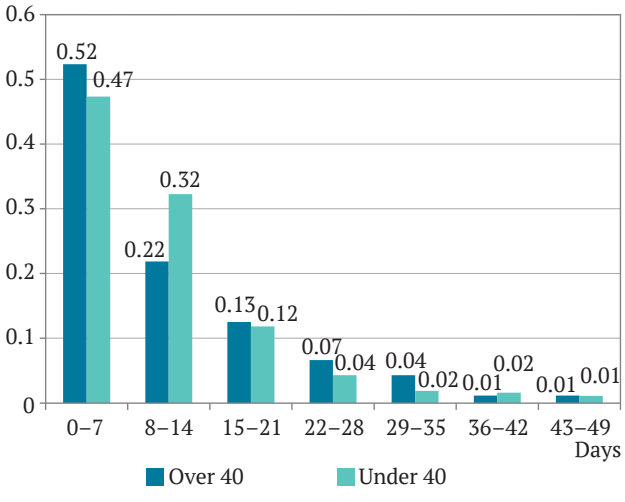

Fig. 6. *Normalized graphs of the distribution of articles review time by scientists under 40 and over 40 for the Journal of "Almaz – Antey" Air and Space Defence Corporation*

Table 2 shows statistical characteristics of the distribution of scientists under 40 and over 40, formulated on the basis of data regarding the duration of 642 reviews preparation from 2013 to 2020.

Table 2

Statistical characteristics of the distribution of review time by scientists over 40 and under 40, days

Age	Expected value (mean value)	Root-mean-square error (spread of values)
Over 40	11.7	13.7
Under 40	11.4	12.9

As Table 2 shows, the average review period and review periods by young scientists and scientists over 40 are very close. The root-mean-square error, which differs by 6 %, is due to flattened out tail of the distribution in Fig. 2. This suggests that young scientists are 6 % less likely to delay the submission of a review for more than 3 weeks than scientists over 40.

Conclusions

1. Engagement of young scientists in the reviewing of manuscripts preserves the quality of the review and the time period it takes to conduct it. At the same time, if a reviewer under 40 agrees to review a paper, the quality of the review is comparable to the opinion of a reviewer over 40. Withdrawal from reviewing occurs when the subject matter of the article suggested for review does not correspond to the subject of the scientific interests of the reviewer.

2. The most effective method of engaging new reviewers to work in a scientific journal is to apply in writing to subordinate enterprises located in various regions of Russia.

3. An increase in the number of reviewers leads to a decrease in the time for manuscript review.

4. The relation between the number of incoming articles, the number of reviewers and the duration of the manuscript review is non-linear. Thus, a twofold increase in the number of incoming articles increased the period of their review fourfold, while an increase in the number of reviewing scientists by 20 % led to a fourfold decrease in the time for reviewing manuscripts.

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INFORMATION ABOUT THE AUTHOR / ИНФОРМАЦИЯ ОБ АВТОРЕ

Denis Yu. Bolshakov, Cand. Sci. (Eng.), Head of the Department of Scientific and Technical Issues and Special Projects of the Office of the Director General, Almaz – Antey Air and Space Defence Corporation, JSC, Deputy Editor-in-Chief of the *Journal of "Almaz – Antey" Air and Space Defence Corporation*, Moscow, Russian Federation; ORCID: 0000-0001-7694-1454; e-mail: press@almaz-antey.ru.

Большаков Денис Юрьевич, кандидат технических наук, начальник отдела научно-технических изданий и специальных проектов аппарата генерального директора, АО «Концерн воздушно-космической обороны "Алмаз – Антей"», заместитель главного редактора научно-технического журнала «Вестник Концерна ВКО "Алмаз – Антей"», г. Москва, Российская Федерация; ORCID: 0000-0001-7694-1454; e-mail: press@almaz-antey.ru.

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