

Aerial Wildfire Fighting: Russian Experience and a Look at the Future

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Introduction

One of the key solutions to reduce the global CO₂ emission is to increase both the absorption capacity of forests and to reduce emissions from wildfires.

According to the latest information from the Global Emission Database¹, the average gross carbon emissions from global wildfires were 7.7 Gt in CO₂ equivalent annually from 1997 to 2017. It represents almost 25% of the total annual CO₂ emission from burning fossil fuels².

Every year, millions of hectares of forest are affected by wildfires, populations are threatened, and flora and fauna are destroyed. In addition, the economic damage caused by global wildfires is estimated to cost billions of dollars, e.g. in Russia in 2016, the wildfire destroyed forests worth about 15 billion rubles.

Greenhouse House Gas (GHG) capture by Russian forests is central in the Climate Doctrine of the Russian Federation³. The Russian Federation, as a party to the Paris Climate Agreement, has established several voluntary commitments to reduce GHG emissions, which are set out in a document

called the Intended Nationally Determined Contribution (INDC) of the Russian Federation. It states that “the long-term goal of limiting anthropogenic GHG emissions in the Russian Federation may be 70-75% of 1990 emissions by 2030, under condition that *the absorption capacity of forests is taken into account as much as possible*”⁴.

A significant increase of the effectiveness of implementing such key solutions may be achieved through integrated wildfire management, including planning, prevention, early detection, firefighting, and the reduction of the negative consequences of fires. Today, the most important element of such an integrated approach is the rational use of modern aviation capabilities.

Aviation, Wildfires and Biodiversity

It is well known that wildfires have serious consequences for biodiversity and biogeochemical cycles. While on a global scale, they cause carbon dioxide emissions, on a local scale, they cause significant changes in biodiversity⁵. This includes the loss of nutrients and carbon from the soil through smoke and subsequent leaching of compounds

1 Global Fire Emissions Database, Version 4.1 GFEDv4. www.globalfiredata.org
<https://catalog.data.gov/dataset/global-fire-emissions-database-version-4-1-gfedv4>

2 Le Quéré, Corinne, et al. “Global carbon budget 2017.” Earth System Science Data Discussions (2017).
http://gci.org.uk/Documents/le_Quere_et_al_Global_Carbon_Budget_2017.pdf

3 Climate Doctrine of the Russian Federation December 2009 (validating Presidential Resolution No. 861-rp), Unofficial translation.
<https://policy.asiapacificenergy.org/sites/default/files/Climate%20Doctrine%20of%20the%20Russian%20Federation%20%28EN%29.pdf>

4 Paris Agreement, UNFCCC, 2015. https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf

5 Kelly, L. T., Bennett, A. F., Clarke, M. F., & Mccarthy, M. A. (2015). Optimal fire histories for biodiversity conservation. Conservation Biology, 29, 473-481. <https://doi.org/10.1111/cobi.12384>

contained in ash⁶. Figure 1 illustrates only 1 fact of the huge damage that global wildfires cause to biodiversity (animals, plants), and soil properties⁷. It shows the 80-year time required to restore the number of soil animals after fires in the Karelia Taiga Forests in the north of Russia.

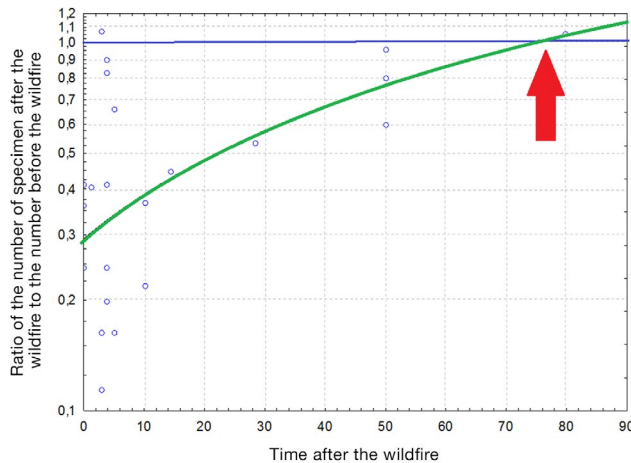


FIGURE 1: Recovery of soil animals after fires in the boreal forests of Karelia.

Given the projected increase in the frequency of wildfires over the next century, it is likely that wildfires will pose a major threat to forest ecosystems around the world⁸.

The effective use of aviation in wildfire management may significantly reduce their CO₂ emissions and contribute to the conservation of biodiversity. This will be accomplished through earlier detection of fires, use of high-tech aviation monitoring tools (including unmanned aerial systems of various dimensions, global satellite monitoring), ensuring higher efficiency of delivery of the necessary volumes of firefighting agents, the early start of fighting operations, and the ability to manage wildfires regardless of the actual availability and condition of local land access roads.

Russian Experience

Forests make up almost half of Russia’s land area (46%), 99.0% of them are Boreal (Taiga) forests, which are most susceptible to fires. The centers of ignition in the forests are commonly located far from settlements and roads. It is for this reason that the use of aerial firefighting in such remote forests is the only effective solution in the field of wildfire management.

Currently Russia has one the strongest, most diverse, and well-equipped firefighting air fleet in the world. Among them, the most widely used multi-purpose aircraft: the An – 2/3 aircraft (load capacity is up to 2 tons), the Be – 200ChS amphibious aircraft(12 tons), and the Ilyushin – 76 transport aircraft (42 tons).The helicopter fleet includes the following: Mil – 8 (4 tons) and the Ka – 32A (3 tons) universal helicopters as well as the Mil – 26T1 heavy multi-purpose transport helicopter (20 tons) (Figure 2)⁹.

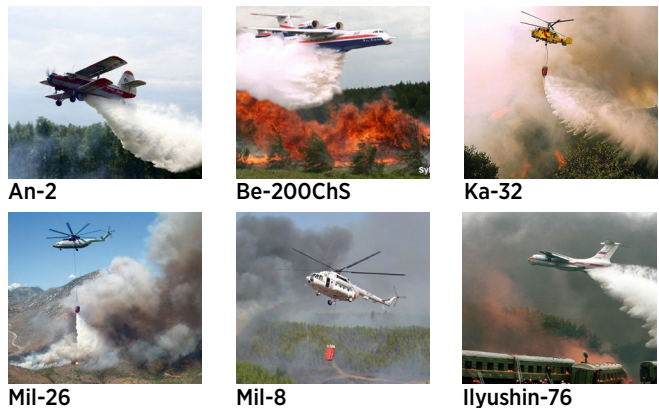


FIGURE 2: Russian aviation fleet for firefighting.

They are successfully used not only in Russia, but also abroad (e.g. in Turkey, Indonesia, Balkan Peninsula, Israel, Portugal, Chile, Serbia, Armenia, Abkhazia and many other countries).

6 Moody, J. A., Shakesby, R. A., Robichaud, P. R., Cannon, S. H., & Martin, D. A. (2013). Current research issues related to post-wildfire runoff and erosion processes. *Earth-Science Reviews*, 122, 10-37. <https://doi.org/10.1016/j.earscirev.2013.03.004>
7 M. Gordin, V. Rozhnov, N.Kopylov, A. Mirzoyan. Aviation and Forest Fire Fighting. ICAO Aviation Green Recovery Seminar. 23-24 November 2020. <https://www.icao.int/Meetings/GreenRecoverySeminar/Documents/3.8%20ICAO%20AGR%20-%20Aviation%20and%20forest%20fire%20fighting.pdf>
8 Bowman, D. M. J. S., Perry, G. L. W., Higgins, S. I., Johnson, C. N., Fuhlendorf, S. D., & Murphy, B. P. (2016). Pyrodiversity is the coupling of biodiversity and fire regimes in food webs. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 371. <https://doi.org/10.1098/rstb.2015.0169>
9 <https://en.mchs.gov.ru/>



FIGURE 3: Regions of Russia with the highest level of biodiversity and having unique ecosystems inhabited by endangered species of animals.

In addition to the threat to the life of population and direct economic losses, wildfires cause enormous damage to biodiversity and habitats of valuable and rare species of animals and plants. Figure 3 shows the regions of Russia with the highest level of biodiversity and having unique ecosystems inhabited by endangered species of animals¹⁰.

ICAO and International Cooperation in Aerial Firefighting

It is quite reasonable to talk about the globalization of the impact of wildfires in the world due to the transboundary nature of their consequences, the lack of local resources, and finally, the global impact on the ecosphere, climate change, and biodiversity.

Currently, there are a large number of United Nations and other international organizations that have organized international cooperation in the field of disaster management, aerial firefighting, and global fire monitoring.

These include the Global Fire Monitoring Center (GFMC), the Forest Fire Advisory Group of United Nations International Strategy for Disaster Reduction (UN-ISDR), the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the International Working Group on Fire Aviation (IFAWG) and others.

At the same time, aerial firefighting has a significant potential to increase the efficiency of using aviation in managing global wildfires and preserving biodiversity. This potential is primarily related to the legal issues of timely participation of aviation of some countries in firefighting in other countries, difficulties in international recognition and appropriate certification of aviation fire equipment, advanced methods and systems for supporting aerial firefighting, ensuring increased flight safety of aerial firefighting, as examples. ICAO could be most successful in addressing these issues.

ICAO could ensure the development of international standards taking into account national law and order,

¹⁰ WWF Russia position on wildfire. <https://wwf.ru/regions/>

the formation of legal bases for the use of international aviation in the wildfires management.

Under the auspices of ICAO, the I4F initiative¹¹ has already initiated a discussion and dialogue on international cooperation to improve the use of aviation in the management of world wildfires.

Conclusion

In conclusion, it is appropriate to recall a quote from President Franklin Roosevelt's address to the famous Chicago Conference: "Full recognition of the sovereignty and judicial equality of all nations, let us work together so that the air may be used by humanity to serve humanity."

With the planned recovery of the aviation sector after the pandemic, ICAO can assist the forest sector, to which humanity owes a great debt, to become more resilient to wildfires, to remain, as before, the main accumulator of CO₂, and thereby affect global CO₂ emission and biodiversity conservation.

Key recommendations for wildfire management include the following:

- Improving the efficiency of wildfire management through the use of aviation has become relevant for reducing global CO₂ emission, taking into account the increased absorption capacity of forests and reducing emission from fires themselves.
- Given the increasingly serious impacts of wildfires on the conservation of biodiversity and biogeochemical cycles, aviation has a special and unique role to play in reducing these impacts.
- Taking into account the extensive successful experience of using the Russian fleet of aerial firefighting vehicles both in our country and abroad, Russia actively supports the ICAO initiative I4F to organize an international dialogue in the field of aerial firefighting.
- The development of the ICAO I4F initiative with the involvement of interested States in broad international cooperation in the field of aerial wildfire management will make it possible in the future to significantly reduce the impact of global wildfires on global CO₂ emission and biodiversity conservation.

11 ICAO Flying Forest Fire Fighting Dialogue (I4F). <https://www.icao.int/Meetings/I4F/Pages/default.aspx>