

Alternative scheme of inclusion of international aviation in EU ETS and Chinese strategy

Yang Xubiao

Abstract:

After slow progress of discussions and negotiations on addressing international aviation emissions under the International Civil Aviation Organization (ICAO), the European Union (EU) decided in 2008, starting from 2012, that all flights arriving to, and flying from the EU, would be included in its emission trading scheme (ETS). The EU's unilateral action has created discord, widespread concern and controversy. Under this arrangement, and through many years of intense negotiations and hard work, three options of market-based measures (MBMs) for addressing international aviation emissions were proposed during the ICAO Council 196th Session in 2012. This paper attempts to discuss the three existing options of MBMs. This paper argues that, although this alternative MBM scheme had an important positive significance, the controversy was even more significant. Faced with such a situation, China should therefore think about what next to do. The author believes that to blindly oppose such a scheme would not solve the problem and would actually make the situation more complicated. China should therefore take on measures such as carbon emissions legislation, technology innovation and operational improvement, international negotiations and cooperation, and development of aviation emissions trading pilot.

Key words:

MBMs, EU ETS, international aviation emission, aviation emissions mitigation, alternative scheme.

Citation:

Xubiao, Yang; Alternative scheme of inclusion of international aviation in EU ETS and Chinese strategy; (July, 2014); Journal of Social Sciences (COES&RJ-JSS), Vol.3, No.3, pp: 426-438.

Alternative scheme of inclusion of international

1. Background

The greenhouse gas (GHG) emissions from the international aviation sector produce an unwanted and significant level of environmental impact. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), the global aviation industry is responsible for around 2% of all human-induced CO₂ emissions (IPCC, 2007). Hence the aviation industry may at present be liable for as high as 14% of man-made climate change (Lee et al, 2009).

The GHG emissions from the international aviation industry seems relatively small, however, the environmental challenge from aviation because of its rapid increase cannot be ignored (Gehring and Robb, 2013). Given the international aviation sector's growing contributions to global warming, the ICAO was tasked to play a pivotal role to discuss and address GHG emissions from the international aviation sector in 1997(article 2.2 of the Kyoto Protocol, 1998).

2. International opposition to the inclusion of aviation into EU ETS

Based on the concern that carbon leakage¹ and competitiveness issues with an EU-only programme would occur (Meltzer, 2012), and in order to effectively tackle impacts of GHG emissions from the international aviation industry, the EU decided that, from the beginning of 2012, all international flights arriving at or departing from EU airports would be included in its EU ETS (Directive 2008/101/EC, 2008).

The EU's unilateral decision sparked very strong reaction outside the EU, in particular from China, India and the US, and created tensions within the international community. Particularly, in the US, there have been attempts to pass the H.R. 2594 bill that would prohibit US airlines from complying with the EU ETS (EU ETS Prohibition of 2011, 2011). Overall, the dissension to the EU's unilateral approach mainly focused on the following aspects: a) the legality of unilateral environmental measures with extraterritorial effect (Tunteng et al, 2012), and b) the application of the EU Aviation Directive to non-EU airlines raised important international trade issues (Ciolino, 2013).

It was in this context that the EU agreed to temporarily suspend the enforcement of the Aviation Directive in order to give space for the ICAO to discuss on developing a global MBM scheme and adopting a framework for MBMs to address international aviation emissions (European Commission, 2012).

3. ICAO's MBMs

Whilst the progress of the ICAO have been deemed to be slow (Macintosh and Wallace, 2009; Meltzer, 2012), they have made excellent progress in tackling international aviation emissions since the organization was commissioned to address GHG emissions from international aviation sector through developing a suitable climate protection mechanism (Truxal, 2011).

The EU Aviation Directive has resulted in, not only strong criticism and opposition from non-EU countries, but also has added to the drive for ICAO to develop a global MBM scheme to address GHG emissions from the international aviation industry (WWF,

¹ Carbon leakage refers to the situation that may occur when, for reasons of costs related to climate policies, the decrease in GHG emissions in one country with stringent climate policies lead to an undesired increase in GHG emissions in other country without climate policies.

2012). Discussions on MBMs by ICAO Member States and relevant organizations centre on the three options (ICAO, 2013): a) global mandatory offsetting; b) global mandatory offsetting with revenue; and c) global emissions trading (cap and trade system). According to the assessment report by ICAO, offsetting options could be less complex and have lower upfront costs than global emissions trading as the latter needs to administer aviation allowances² from global emissions trading. Compared with global mandatory offsetting, global mandatory offsetting complemented by a revenue generation mechanism is more complex as it has to tackle revenue generated by applying a fee (for example, a transaction fee) to each tonne of CO₂ (ICAO, 2013).

4. Review on MBMs

Since the MBMs were proposed, ICAO have been actively seeking international consensus to improve the perception of the MBMs. After so many years of discussions and negotiations, the first-ever global deal, which was proposed in 2012, and eventually was agreed by the 38th Session of the Assembly in 2013, is now a part of a number of measures that ICAO Member States can use to address GHG emissions from international aviation industry.

4.1 Significance and impact

Since introducing the MBMs, experts, ICAO's Member States, other international organizations, and even some industry insiders have expressed that the resolution on the MBMs would have a positive significance, and impact on aviation industry, environmental protection and the world economy. Roberto Kobeh González, the President of the Council of ICAO, described the MBM scheme as “a historic milestone for aviation and for the role of multilateralism in addressing global climate challenges” (González, 2013).

4.1.1 Achievement and progress

The most important aspect of MBMs, related to international aviation emissions, is that the options of MBMs are now successfully accounting for the principle of Common but Differentiated Responsibilities (CBDR) and respective capabilities, and the special circumstances (RCSC). They strongly recommend the revenues from MBMs should be applied, as a priority, to curb the environmental impacts of international aviation emissions, as well as provide assistance to and support for developing States to address aviation emissions policies (ICAO, 2013). If these principles were fully implemented, the Member States' opposition to the inclusion of non-EU airlines into the EU ETS would therefore be weakened, international cooperation would be intensified.

The second key achievement regards a framework for MBMs to tackle GHG emissions from the international aviation emissions. The challenges implementing a unique global sectoral system to tackle international aviation emissions are unprecedented. Building upon the view that the lack of framework for MBMs to address international aviation emissions could make coordination more difficult, bring about risks of distortion of competition, impose unnecessary burdens on industry and make industry compliance more complicated (ICAO, 2009). Therefore, in order to facilitate the application of the international aviation emissions mitigation, the Group on International Aviation and Climate Change (GIACC) recommends a framework for MBMs in international aviation

² Aviation allowance is similar to emissions unit in concept. The creation of aviation allowances are based on one allowance equivalent to one tonne of CO₂.

Alternative scheme of inclusion of international

should be developed. The ICAO framework for MBMs provides a series of agreed criteria that defines the guiding principles, design elements, and makes up common building blocks for the purpose of developing a global MBM scheme (ICAO, 2012).

The third more significant aspect regards the qualitative and quantitative assessment of the three options for a global MBM scheme. The results showed that all three options are technically feasible, and the ICAO's environmental goals can be achieved through the implementation of the three options (ICAO, 2013).

It is especially to be noted that the MBMs regards *de minimis* threshold to MBMs. According to the provision of *de minimis* threshold, there will be no any attribution of specific obligations to particular routes or market with low levels of international aviation activity (Resolution A38-18, 2013). This provision actually shows consideration for the special circumstances and respective capabilities of developing countries.

4.1.2 A multilateral agreement on bridging the gap between Member States

The MBM scheme would be a multilateral agreement rather than unilateral agreement. Parties would be expected to actively participate in international negotiations within the ICAO framework, which would contribute introducing equal consultation on global aviation emissions. The EU announced in 2012, that it would suspend enforcement of the EU Aviation Directive in order to allow ICAO to continue its progress towards a global aviation emissions scheme (European Commission, 2012). Shortly after the end of the 38th session of the Assembly, the European Commission stressed in the written statement that they will strongly support the ICAO 38th Assembly's decision on developing a global MBM scheme for addressing international aviation emissions and will further contribute to the work on the design of the global MBM scheme (EU Written Statement of Reservation, 2013). The softening of the EU's position also seemed to be the beginning of the solution to the conflict over the EU Aviation Directive. Other Member States have adjusted their strategies to actively and pragmatically participate in discussions on MBMs in order to reach a collective agreement. At largely extent, agreement on MBMs for international aviation emissions is actually multi compromise reflecting Parties' concerns and benefits.

4.1.3 Accelerating mitigation of aviation emissions

The principles of MBMs, and a framework for global implementation, provide thinking and direction for work related to the further mitigation of international aviation emissions for the next few years. The 38th ICAO Assembly has agreed to develop, by 2016, a global MBM scheme to tackle GHG emissions from the international aviation that will come into force in 2020. Viewed from the perspective of environmental protection, MBMs provide certainty that ensure effective and efficient delivery of the global aspirational goal by 2020, along with other measures (ICSA, 2013). Though some issues and problems could be encountered when implementing existing or possible MBMs for international aviation sector, by utilising MBMs reached through constructive bilateral and multilateral consultations and negotiations, Member States can drive their aviation emissions reduction actions forward.

4.2 Divisions and controversy

Although MBMs have long been seen as the means to close the gap, agreement amongst ICAO's 190 member states on their application has so far proved fragile. There is still a number of objections surrounding MBMs, and reservations have been expressed with

regard to elements of the Resolution A 38-18 (Reservations to Resolution A38-18(17/2), 2013). These show largely divided opinion along Member States (see Table 1).

Table 1 Summary listing of reservations to resolution A38-18

Reservations to elements of Resolution A 38-18	Member States
Voluntarily contribute to achieving the global aspirational goals (Preambular paragraph 10)	Australia
Global aspirational goal of carbon-neutral growth from 2020 (Paragraph 6)	Argentina, Australia, Bahrain, Brazil, China, Cuba, India, Lithuania [on behalf of the 28 Member States of the European Union (EU) and 14 other Member States of the European Civil Aviation Conference (ECAC)], Nicaragua, the Russian Federation, Saudi Arabia and Venezuela (Bolivarian Republic of)
Feasibility of a long term global aspirational goal for international aviation (Paragraph 7)	Australia
Mutual agreement on national/regional MBMs (Paragraph 16)	Lithuania (on behalf of the 28 Member States of the EU and 14 other Member States of ECAC) and Singapore
1% RTK <i>de minimis</i> on routes serving developing countries (Paragraph 16 b))	Afghanistan, Australia, Canada, Japan, New Zealand, Qatar, the United Arab Emirates and the United States
Taking into account the special circumstances and respective capabilities of developing countries, while minimizing market distortion (Paragraph 20)	Australia
<i>De minimis</i> exemptions from/phased implementation for developing countries (Paragraph 21)	Australia
MBMs should take account of CBDR/SCRC/Non-discrimination (Annex Guiding principle p))	Australia, Canada, Japan, Lithuania (on behalf of the 28 Member States of the EU and 14 other Member States of ECAC), New Zealand, the Republic of Korea and the United States

Source: ICAO

4.2.1 The details of the scheme have still to be finalised

Alternative scheme of inclusion of international

For the three options of MBMs, many details were yet unclear: a) how to resolve the application of CBDR? Having references inserted considering the principle of CBDR in MBMs can be viewed as a success for the BRICs³, however it raises the new issue of conflict between the principle of CBDR and the principle of non-discrimination and equal and fair opportunities (Lyle, 2013). b) if offsetting options are to be implemented, what will be chosen as the standard for offsetting scheme? Certified Emissions Reduction credits (CERs) from the Clean Development Mechanism (CDM), European Union Allowances (EUAs) of the EU ETS, Emissions Reduction Units (ERUs) of the Joint Implementation mechanism (JI), Voluntary Emissions Reduction credits (VERs), or other standards? If global emission trading is to be implemented, how can a cap be determined? Fixed or adjusted? c) various programs will eventually be implemented in the control right of the "aviation carbon emissions", then who is responsible for these programs? How to manage these programs? d) is the revenue generated from emissions allowance to be paid to a third party or ICAO to manage? e) how will it be guaranteed ensure that the revenue raised will be invested in environmental protection or will provide assistance to developing States for mitigation of GHG emissions from international aviation? f) How to balance the use of revenue in countries around the world to ensure fairness? h) How to balance the interests of all parties if a single, meaningful global agreement on MBMs to be achieved?

4.2.2 The troubles with MBMs execution

As a subsidiary body of the United Nations, ICAO's main function is to promote global civil aviation safety and orderly development. However, the MBMs for the global goal of carbon-neutral growth by 2020 may be regarded as fragile because of the nature of no enforcement authority and the lack of definitive binding of its resolutions (Lyle, 2013). In fact, ICAO acts as much more a medium of Member States in order to expand cooperation in the field of international civil aviation, and the coercive power of its decisions and directions are still in doubt.

In fact, offsetting option has proved by many groups that it is not the most effective method to address the international aviation emissions in the long term. Offsetting is merely a mechanism for compensating these GHG emissions by paying for equivalent emissions savings or reduction to be made throughout investment in reduction projects elsewhere (Hooper et al, 2012). It cannot actually reduce GHG emissions in the aviation sector itself, and most importantly, the offsetting must be of high quality, if not, the international aviation emissions would actually result in worse outcomes (Carbon Market Watch, 2013).

As far as global emissions trading (cap-and-trade system) is concerned, it could encounter many issues and restrains because of its operational complexity and higher upfront costs, as well as the obvious imbalance of implementation levels of MBMs in developing/developed Member States.

4.2.3 Conflict between principles

During many international discussions and negotiations related to addressing GHG emissions from international aviation, the BRICs and other developing countries

³ BRIC is the acronym for an association of four major emerging national economies:

Brazil, Russia, India and China. The grouping is known as "BRICS" after inclusion of South Africa in ??????

justifiably insisted that developed countries should bear greater responsibilities of the international emissions mitigation under the principle of CDBR. The principle of CDBR was successfully adopted in the Resolution A38-18 by ICAO, however, developed countries, especially European countries did object to this. Their reasoning was that given the fact that aviation emissions from developing countries are rapidly increasing and developing countries are contributing to the largest growth from aviation emissions (Light, 2013). Thence, the developing countries also need to contribute to aviation emissions mitigation (Lyle, 2013). The EU, and other developed countries, especially indicated that China should assume greater responsibility for carbon emissions mitigation because of the rapid growth of China's civil aviation industry, compared with the increasingly saturated aviation market in European and American (Yang, et al, 2011). There seems to be an irreconcilable conflict between the principle of CDBR and the principle of non-discrimination and equal and fair opportunities. As yet, no more desirable alternative acceptable to all Member States has been found to be applied for closing the gap.

Oppositions to the principle of CDBR also result from the concern of its negative impacts. Europe's 44 countries hold that the principle of CDBR would create market distortions and discrimination among operators (EU Written Statement of Reservation, 2013). Australia states that the CDBR would damage principle of non-discrimination and fair and equal treatment, and might bring about confusion and discrimination (Reservation by Australia to Resolution A38/17/2, 2013). Canada's reservations reflect the same concerns over the situation (Statement of Canada's Reservations, 2013). These disagreements on the principle of CDBR between the developed and developing Member States have impeded an aviation emissions reduction agreement binding all Parties moving forward.

5. Impacts on China and strategies

5.1 impacts of ICAO MBMs on China

The impacts of the three options of MBMs on China are mixed. The "global mandatory offsetting scheme" seems to be more favourable to China. One reason is that management and implementation of offsetting is not complicated. Another reason is that Clean Development Mechanism would provide a better foundation for possible offsetting scheme. However, as mentioned above, offsetting is not a long-term approach to limit or reduce the actual GHG emissions into the atmosphere. Therefore, aviation environmental goal would be difficult to be actually achieved in China. Global mandatory offsetting with revenue could generally function the same way as the mandatory offsetting scheme. A key aspect is to determine whether or how the revenue, which is generated by applying a fee to each tonne of carbon, can be provided to support China to reduce GHG emissions from the aviation sectors. As far as global emissions trading (cap-and-trade system) is concerned, if it is to be implemented, a super-sovereign international organization must be built to co-ordinate and manage it. It is of most importance that it must create globally harmonized approaches to monitor, report and verify aviation emissions from Member States. Thence, global emissions trading (cap-and-trade systems) can be more complex and efficient management and scientific methods must be required. Both the Chinese government and Chinese business have a lack of deep understanding of MBM schemes, and are also much less operationally experienced with the schemes and their technical advantages. It will be more difficult for China to develop and implement aviation emission trading.

Overall, the situation now is not optimistic. On the one hand, the domestic emissions trading system is still in its infancy. Even if the ICAO MBMs could reach a consensus

agreement in 2016, in the international carbon trading market, China is also in a very disadvantageous position (Zhou, He, 2009); Meanwhile, the principle of CDBR, which is being actively advocated by developing countries, and was being taken into account by the ICAO 38th Assembly, has not been fully accepted by developed countries, which will inevitably increase China's cost of addressing aviation emissions.

5.2 Strategies of China

Aviation emissions mitigation is a global trend. For China, the most important work on mitigation of aviation emissions is urgently to catch up with the rest of the world. No decision on which option of MBMs has been taken. However, China should initiate work immediately and as a priority in order to coordinate possible MBM scheme to addressing aviation GHG emissions.

5.2.1 Regulation and legislation recommended

China has currently promulgated the 12th five-year Plan of the Civil Aviation Industry and Civil Aviation Industry Energy Conservation and Emissions Reduction Plan (2005-2015) in order to guide and tackle GHG emission. Consistent with the Assembly Resolution A37-19, China has submitted its ambitious action plan to actively mitigate the impact of international aviation GHG emissions on climate change to the ICAO. However, this is not enough and more needs to be done, such as developing specific sectoral laws to direct mitigation of GHG emissions from aviation sector; legislating for the ETS to facilitate, deploy and implement MBMs for mitigating aviation emission; and inspection and evaluation of existing relevant laws to reduce obstacles of implementation to aviation emissions mitigation; etc.

5.2.2 Technology innovation and operation improvement

The 38th Assembly developed a set of guiding principles for MBMs to tackle GHG emissions from international aviation. These principles mostly reflect the four pillar strategy outlined by ICAO and other organizations in order to achieve carbon-neutral growth goals⁴ and fuel efficiency improvement targets⁵: a) improved technology; b) more efficient aircraft operations; c) infrastructure improvements; and d) a properly-designed MBM (IATA, 2009).

China should play an important role in contributing towards these targets. First, given the fact that, of the four pillar strategy, technology is the most efficient means for

⁴ A collective medium-term global aspirational goal of keeping the global net carbon growth rate below 1% by 2050, consistent with the goal of limiting global temperature rise to 1.5°C by 2100.

⁵ The goal is to reduce CO₂ emissions per revenue tonne kilometre performed by 2020 by 80% compared to 2000. Unlike ICAO's fuel efficiency improvement goal, Airports Council International (ACI), Civil Air Navigation Services Organization (CANSO), International Air Transport Council of Aerospace Industries Association (ICCAIA) jointly announced to continuously improve CO₂ emissions per revenue tonne kilometre performed by 2020 by 80% compared to 2000.

mitigating aviation emissions (IATA, 2009), it is pivotal to introduce appropriate policies and incentives to advance and implement new technology such as retrofitting winglets, updating production and new aircraft. Second, it is of urgency to get rid of legal, economic and institutional barriers to improve operational efficiency such as development and implementation of more efficient routings and procedures. Third, it is necessary to adopt positive and pragmatic measures to strive for assistance from the international community such as financial support, technology transfer, information exchange and capacity building (NDRC, 2013).

5.2.3 International consultation and cooperation

With the deepening political agenda of the global aviation emissions mitigation in response to climate change, China's responsibility towards the mitigation of aviation emissions is inevitable because of their rapid development of aviation industry and the contributions to GHG emissions from this aviation sector. China should not only recognize their own responsibility towards mitigating aviation emissions, but also take into account the applicability of MBMs by ICAO in China. With a positive and pragmatic attitude to participating in international negotiations on tackling aviation emissions, China needs to focus on the layout of the future global carbon market, and push forward ICAO to achieve a meaningful agreement on MBMs. China needs to seek inspiration from the existing options of MBMs in order to try to launch an aviation emissions trading pilot. China can introduce lessons from its emissions trading pilot into the possible option of MBMs for mitigation of international aviation emissions.

China's participation in multilateral and bilateral cooperation has been put on the agenda, and some very optimistic outcomes have been achieved. For example, China and the United States launched China-U.S. joint statement on climate change on 15 February 2014 (China-U.S. joint statement on climate change, 2014). Both sides decided unanimously that they will work together to jointly address environmental issues encountered by the two sides through five initiatives. It provides a successful example for a decision on the designing and implementing option of MBMs for international aviation through constructive bilateral and/or multilateral consultations and negotiations.

5.2.4 Advance mitigation of aviation emissions pilot

Based on the EU ETS's operational experiences and lessons, as well as constructive outcomes of international discussions and negotiations on addressing international aviation emissions, China's emissions trading scheme for addressing aviation emissions should be designed and built to tackle GHG emissions from the aviation industry. Referring to the existing framework for securities trading of China's capital market, planning and designing for China's emissions trading scheme should not only be based on the existing voluntary emissions trading system, but also focus on the future mandatory trading mechanism. It is necessary not only to consider the special circumstances and respective capabilities of the aviation industry, but also to take into account its own responsibilities of international aviation emissions mitigation. Based on the understanding above, China must build a carbon emissions trading system which can be conducive to economic restructuring, and reduce aviation emissions intensity and maintain international competitiveness of the Chinese economy (Yin, Cui, 2010).

Alternative scheme of inclusion of international

China has launched seven emissions trading pilots⁶, which collectively are expected to cover 700 million tons of CO₂-equivalent by 2014 (Song and Lei, 2014). This is a positive sign that China is fulfilling its responsibilities of aviation emissions mitigation. It is of more importance that the experiences and lessons gained from these pilots, although in their initial stages, will actively promote China's aviation emissions mitigation.

Conclusion

The ICAO 38th Assembly's adoption of a resolution to develop a global MBM scheme mitigating GHG emissions from the international aviation is a significant step forward since the ICAO was appointed to play a pivotal role in tackling international aviation emissions. According to the Resolution A38-18, based on the EU ETS and other existing measures' operational experience and lessons, as well as constructive outcomes of international discussions and negotiations on addressing international aviation emissions, China should positively and pragmatically develop and deploy mitigation of aviation emissions. Although they have encountered major issues, problems and even barriers, there could be a consensual agreement on addressing growing international aviation emissions as long as States engage in constructive bilateral or multilateral consultations and negotiations.

Note

This paper is part of the research project "the influence of charging carbon emission on aircraft operating management", which is part of the "visit (training) project abroad" funded by the Shanghai Municipal Education Commission. The study is undertaken while visiting at the University of Edinburgh; the visit is being hosted by Dr Gbenga Ibikunle of the University of Edinburgh Business School.

References

- [1] IPCC. (2007) Fourth Assessment Report, Contribution from Working Group III. In: Metz, B, Davidson, O.R., Bosch, P.R., Dave, R., Meyer, L.A (Eds.), Cambridge University Press, Cambridge, United Kingdom.
- [2] David S. Lee, David W. Fahey, Piers M. Forster, Peter J. Newton, Ron C. N. Wit, Ling L. Lim, Bethan Owen, Robert Sausen. (2009) Aviation and global climate change in the 21st century, *Atmospheric Environment* 43, pp. 3520–3537.
- [3] Markus W. Gehring, Cairo A. R. Robb. (2013) Addressing the Aviation and Climate Change Challenge: A Review of Options, International Centre for Trade and Sustainable Development (ICTSD), Issue Paper No.7, July, p. 3.
- [4] United Nations. (1998) Kyoto Protocol to the UN Framework Convention on Climate Change, art.2.2. p. 2.
- [5] Sander de Bruyn, Dagmar Nelissen, Marnix Koopman. (2013) Carbon leakage and the future of the EU ETS market: Impact of recent developments in the EU ETS on the list of

⁶ Beijing, Shanghai, Shenzhen, Guangdong, Tianjin, Hubei and Chongqing have launched or are scheduled to launch their respective emissions trading pilot. Each of the emission trading scheme pilots are designed and implemented by the respective regional provincial or municipal development reform commission, with the exception of Guangdong's which is being led by the Guangzhou Environmental and Energy Institute.

sectors deemed to be exposed to carbon leakage, Delft, CE Delft, April 2013, p. 13, [Online],

available:http://www.cedelft.eu/art/uploads/CE_Delft_7917_Carbon_leakage_future_EU_ETS_market_Final.pdf.

[6] Joshua Meltzer. (2012) Climate Change and Trade-The EU Aviation Directive and the WTO, *Journal of International Economic Law*, vol.15, no.1, pp. 111-114.

[7] European Commission. (2009) Directive 2008/101/EC of the European Parliament and of 19 November 2008, amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading with the community, *Official Journal of the European Union*, 13 January.

[8] H.R.2594 (112th). (2011) A Bill: To prohibit operators of civil aircraft of the United States from participating in the European Union's emissions trading system, and for other purpose, 20 July, pp.2-4.

[9] Verki Michael Tunteng et al. (2012) Legal Analysis on the Inclusion of Civil Aviation in the European Union Emissions Trading, Centre for International Sustainable Development Law(CISDL), May, p. 11.

[10] Ciolion. (2013) UP IN THE AIR: THE CONFLICT SURROUNDING THE EUROPEAN UNION'S AVIATION DIRECTIVE AND THE IMPLICATIONS OF A JUDICIAL RESOLUTION, *Brooklyn Journal of International Law*, vol. 38:3, p. 1152.

[11] European Commission. (2012) Proposal for a Decision of the European Parliament and of the Council, derogating temporarily from Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community, 12 November, p. 4-5.

[12] Andrew Macintosh, Lailey Wallace. (2009) International aviation emissions to 2025: Can emissions be stabilised without restricting demand, *Energy Policy* 37, pp.264-265; Joshua Meltzer. (2012) Climate Change and Trade-The EU Aviation Directive and the WTO, *Journal of International Economic Law*, vol.15, no.1, p. 114

[13] Steven Truxal. (2011) The ICAO Assembly Resolutions on International Aviation and Climate Change: An Historic Agreement, a Breakthrough Deal, and the Cancun Effect, *Air & Space Law* 36, no.3, pp:217-239.

[14] World Wild Fund for Nature (WWF). (2012) Aviation Report: Market Based Mechanism to Curb Greenhouse Gas Emissions from International Aviation, p. 6.

[15] International Civil Aviation Organization. (2013) Assembly-38th Session Executive Committee, Working paper (A38-WP/29), Agenda Item 17: Environmental Protection, market-based measures (MBMs) (Presented by the Council of ICAO), 4 September, p. 2.

[16] International Civil Aviation Organization. (2013) Report of the assessment of market-based measures, First Edition, p. 7-1.

[17] Union Aviation, New Release. (2013) Dramatic MBM agreement and solid global plan endorsements help deliver landmark ICAO 38th Assembly, [Online], Available:<http://www.icao.int/Newsroom/News%20Doc%202013/COM.36.13.A38.Closing.EN.pdf> [4 Oct 2013].

[18] International Civil Aviation Organization. (2013) Resolutions adopted at the 38th Session of the Assembly-A38-18: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change, November.

[19] International Civil Aviation Organization. (2013) Assembly-38th Session, Report of the Executive Committee on Agenda Item 17: Environmental protection, 3 November, p. 17-3.

[20] International Civil Aviation Organization. (2009) Group on International Aviation and Climate Change (GIACC) Report, 1 June, p. 16.

Alternative scheme of inclusion of international

- [21] International Civil Aviation Organization. (2012) Council-196th Session, Working paper (C-WP/13861), Subject No. 50: Questions relating to the environment, market-based measures (MBMs), Appendix A-Design Features of Options for a Global MBM Scheme (Presented by the Secretary General), 7 June, p. 4.
- [22] International Civil Aviation Organization. (2013) Report of the Assessment of Market-based Measures (Doc 10018), First Edition, p. 7-1.
- [23] European Commission. (2012) Proposal for a Decision of the European Parliament and of the Council, derogating temporarily from Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community, 12 November, p. 4-5.
- [24] European Commission. (2013) Written statement of reservation by Lithuania on behalf of the 28 Member States of the European Union and 14 other Member States of the European Civil Aviation Conference with regard to ICAO Assembly Resolution A38-18, October.
- [25] International Coalition for Sustainable Aviation. (2013) ICSA Position Paper: Market-based measures are essential address greenhouse gas emissions from international aviation, March, p. 3.
- [26] International Civil Aviation Organization. (2013) the 38th Session of the Assembly, Summary Listing of Reservations to Resolution A38-18 (17/2), November
- [27] Chris Lyle. (2014) Mitigating international air transport emissions through a global measure: time for some lateral thinking, [Online], Available: <http://www.greenaironline.com/news.php?viewStory=1820> [6 February 2014].
- [28] Chris Lyle. (2014) Mitigating international air transport emissions through a global measure: time for some lateral thinking, [Online], Available: <http://www.greenaironline.com/news.php?viewStory=1820> [6 February 2014].
- [29] Paul Hooper, Ben Daley, Holly Preston, Callum Thomas. (2012) Final OMEGA Project Report: An Assessment of the Potential of Carbon Offset Schemes to Mitigate the Climate Change Implications of Future Growth of UK Aviation, [Online], Available: <http://www.cate.mmu.ac.uk/wp-content/uploads/2012/06/5-Final-Report-Potential-Carbon-Offsetting-to-Mitigate-Clima.pdf> [16 May 2014].
- [30] Carbon Market Watch. (2013) Turbulences Ahead: Market-based measures to reduce aviation emissions, Policy Brief, June, p. 2.
- [31] Andrew Light, an Equity Hurdle in international Climate Negotiations, *Philosophy & Public Policy Quarterly*, vol. 31, no. 1, Spring, pp. 28-29.
- [32] Chris Lyle. (2014) Mitigating international air transport emissions through a global measure: time for some lateral thinking, [Online], Available: <http://www.greenaironline.com/news.php?viewStory=1820> [6 February 2014].
- [33] Yang Zhi, Wang Mengyou, Ma Yurong. (2011) Economic analysis of carbon emissions trading scheme, *Study & Exploration*, no. 1, pp. 138-140.
- [34] European Commission. (2013) Written statement of reservation by Lithuania on behalf of the 28 Member States of the European Union and 14 other Member States of the European Civil Aviation Conference with regard to ICAO Assembly Resolution A38-18, October.
- [35] The Australian Representative on the Council of the International Civil Aviation Organization. (2013) Reservation by Australia to Resolution A38/17/2 on international aviation and climate change, Our Reference: ENV2/1, 5 November.
- [36] Permanent Mission of Canada to the International Civil Aviation Organization. (2013) Statement of Canada's Reservations Regarding the 38th International Civil Aviation Organization General Assembly Resolution: Consolidated Statement of

Continuing ICAO Policies and Practices Related to Environmental Protection-Climate Change, 1 November.

[37] Zhou Jian, He Jiankun. (2009) EU Policies of Climate Change and their Impacts, *Modern International Relations*, no. 2, pp. 38-43.

[38] International Civil Aviation Organization. (2013) Resolutions adopted at the 38th Session of the Assembly-A38-18: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change, November.

[39] International Air Transport Association (IATA). (2009) A global approach to reducing aviation emissions-first stop: carbon-neutral growth from 2020, November, pp. 2-4.

[40] International Air Transport Association (IATA). (2009) A global approach to reducing aviation emissions-first stop: carbon-neutral growth from 2020, November, pp. 2-4.

[41] The National Development and Reform Commission of the People's Republic of China. (2013) China's Policies and Actions for Addressing Climate Change, pp. 60-63.

[42] U.S.-China joint statement on climate change, [Online], Available: <http://en.ccchina.gov.cn/Detail.aspx?newsId=42977&Tid=98> [15 Feb 2014].

[43] Yin Yingkai, Cui Maozhong. (2010) Study of China's Program on Building the International Carbon Finance System, *Studies of International Finance*, no.12, pp. 59-66.

[44] Song Ranping, Lei Hongpeng. (2014) Emissions Trading in China: First Report from the Field, [Online], Available: <http://www.wri.org/blog/emissions-trading-china-first-reports-field> [24 Jan 2014].

About author:

Yang Xubiao

Department of Aerial Operation Engineering, College of Aeronautic Transportation, Shanghai University of Engineering Science

Shanghai, 201620

Research Visitor at University of Edinburgh Business School

XXXXXXXXXXXXXXXXXXXXXXXXXXXX