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BIBLIOTECA NACIONAL DE CUBA JOSÉ MARTÍ

BIBLIOGRAPHIC COUPLING AND COLLABORATIVE NETWORK ANALYSIS ON AEROSPACE PUBLICATIONS: BASED ON SCIENTOMETRIC APPROACH

ACOPLAMIENTO BIBLIOGRÁFICO Y ANÁLISIS DE REDES COLABORATIVAS SOBRE PUBLICACIONES AEROESPACIALES: BASADO EN UN ENFOQUE CIENTOMÉTRICO

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ABSTRACT

Objective. Aerospace is one of the growing industries; it has determined a particular country's economic growth. Over the preceding two decades, the aerospace sector has seen tremendous growth. Therefore, "Aerospace" has been considered for scholarly attention from the Web of Science database from 2013 to 2022. Nevertheless, in extant literature in the aerospace field, the researchers have failed to conduct a scientometric approach in collaborative network analysis and bibliographic coupling analysis. **Design/Methodology/Approach.** The study has been conducted using the scientometric approach to understand the current trend of aerospace publications. The software tools Bibexcel and VOS Viewer were used for analyzing the data. Further analysis was utilized through Microsoft Office and Excel statistical tools. **Results/Discussion.** The analyzed 20250 bibliographic data has been collected. The study's findings show that year-wise publications increased from 2013 (965) to 2022 (3,953), and the annual growth rate shows a fluctuating trend. The eminent author of the study is Wang J. He has published 146(72%) publications, and collaborative authorship shows that authors Li J and Zhang Y have highly collaborated on aerospace publications with 12(0.05%). The data from the analysis carried out are available at: https://zenodo.org/records/10663289 **Conclusions.** In conclusion, Peoples R China has many publications, 7421(36.54%), and Peoples R China has collaborated with the UK, the US, and Singapore. The Chinese Academy of Science institution has published 556(2.7%) of documents more than other institutions. **Originality value.** The findings from the study could be helpful for future research issues and directions. The

present study has provided a comprehensive insight into Aerospace publication trends and collaborative networks of authors and countries and analyzed the bibliographic coupling networks between authors' countries and documents.
KEYWORDS: Aerospace; Scientometric; Bibliographic coupling analysis; Collaborative network analysis; Citation analysis

RESUMEN

Objetivo. La industria aeroespacial es una de las industrias en crecimiento; ha determinado el crecimiento económico de un país en particular. Durante las dos décadas anteriores, el sector aeroespacial ha experimentado un enorme crecimiento. Por lo tanto, "Aeroespacial" ha sido considerado para la atención académica de la base de datos Web of Science de 2013 a 2022. Sin embargo, en la literatura existente en el campo aeroespacial, los investigadores no han logrado llevar a cabo un enfoque cienciométrico en el análisis de redes colaborativas y el análisis de acoplamiento bibliográfico. **Diseño/Metodología/Enfoque**. El estudio se ha realizado utilizando el enfoque cienciométrico para comprender la tendencia actual de las publicaciones aeroespaciales. Para el análisis de los datos se utilizaron las herramientas informáticas Bibexcel y VOS Viewer. Se utilizaron análisis adicionales a través de herramientas estadísticas de Microsoft Office y Excel. **Resultados/Discusión**. Se han recogido los 20250 datos bibliográficos analizados. Los hallazgos del estudio muestran que las publicaciones anuales aumentaron de 2013 (965) a 2022 (3953), y la tasa de crecimiento anual muestra una tendencia fluctuante. El eminente autor del estudio es Wang J. Ha publicado 146 (72%) publicaciones, y la autoría colaborativa muestra que los autores Li J y Zhang Y han colaborado mucho en publicaciones aeroespaciales con 12 (0,05%). Los datos del análisis realizado están disponibles en: https://zenodo.org/records/10663289 **Conclusiones.** En conclusión, Peoples R China tiene muchas publicaciones, 7421 (36,54%), y Peoples R China ha colaborado con el Reino Unido, Estados Unidos y Singapur. La institución de la Academia China de Ciencias ha publicado 556 (2,7%) de documentos más que otras instituciones. Valor de **originalidad**. Los hallazgos del estudio podrían ser útiles para futuras cuestiones y direcciones de investigación. El presente estudio ha proporcionado una visión integral de las tendencias de publicación aeroespacial y las redes de colaboración de autores y países y analizó las redes de acoplamiento bibliográfico entre los países y los documentos de los autores.
PALABRAS CLAVE: Aeroespacial; cienciométrica; Análisis de acoplamiento bibliográfico; Análisis de redes colaborativas; Análisis de citas

1. INTRODUCTION

Aerospace has been used to refer to outer space and the atmosphere collectively. Aerospace is a growing industry. of engineering that works in the design, development, testing and production of airborne objects such as aircraft, missiles, spacecraft, rocket propulsion systems, and other related systems. Aerospace engineering can fall into the categories of aeronautical or astronautical engineering. Aerospace organizations research, design, manufacture, operate or maintain aircraft and spacecraft It has a diverse field with many industrial, commercial, and military applications. Aerospace engineering is the branch. Aerospace manufacturing is a high-technology industry that produces aircraft, guided missiles, space vehicles, aircraft engines, propulsion units, and related parts. Aerospace engineers develop leading-edge technologies and integrate them into aerospace vehicle systems for transportation, communications, exploration, and defence applications. Modern aerospace began with engineer George Cayley in 1799; Cayley proposed an aircraft with a "fixed wing and a horizontal and vertical tail", defining characteristics of the modern Aeroplan. The aerospace industry is a cooperation of public and private sectors in most industrial countries. Several countries have a civil space program funded by the government. Over the years, the aerospace industry has witnessed remarkable advancements, pushing the boundaries of what is possible and expanding our understanding of the universe. Russell (2017) indicated that air transportation facilitated a growth of 7% in productivity in the US from 1997 to 2014. Based on the statistical information of the International Civil Aviation Organization, the worldwide carried passengers count has increased from 2.7 billion in 2010 to 4.49 billion in 2019 (ICAO, 2019). The International Civil Aviation Organization's (ICAO) second International Aerospace Symposium addresses specific issues such as safety management of airspace, spaceport safety and operations, and the development of performance-based standards; furthermore, it focuses on emerging space activities and civil aviation (ICAO, 2016). The aviation sector's exponential growth has been attributed to the positive economic

externalities associated with air connectivity (Yao and Yang, 2019). The aviation sector has not only provided a transportation network, but additionally, it has also provided economic growth, trade, tourism and jobs. Various study findings show that air transportation has played a vital role in the country's economy and social development (Daley, 2009). The International Air Transport Association (IATA) hosted an aviation conference in Mexico for the first time, the 13th edition of Wings of Change Americas, discussing the various aspects of harnessing the potential of aviation in driving economic resurgence and social progress across Latin America and the Caribbean. The International Air Transport Association (IATA) looks forward to working with the Mexican government to create a joint agenda to utilize aviation to create jobs and economic opportunities for the country and its people. For attaining sustainable aviation, airlines are fully committed to achieving net zero carbon emissions by 2050 (IATA, 2023). According to the IATA Air passenger market analysis, global air passenger revenue increased by 28.4% in August 2023, and the analysis shows that airlines in all regions have achieved growth in traffic and passenger load factors compared to the same month of 2022. Based on the statistic of the Aerospace Industrial Association, job supported by the A&D industry represents approximately 1.4 per cent of the nation's total employment base. Moreover, the A&D industry generated $391 billion in economic value, which represented 1.7 per cent of the total nominal GDP in the US. These findings of the statistical data confirm that the aerospace industry has developed in the preceding decades.

1.1 Scientometric analysis and bibliographic coupling analysis

Scientometrics is one of the measuring techniques of library and information science discipline. It uses various mathematical and statistical measurements of the evaluation, advancement of science, its level of development, impact, and relevance to human society. It is considered a quantitative technique to measure various science parameters at individual, institutional, national, and even international levels. Scientometrics is "the application of those quantitative methods which deal with the analysis of science viewer as an information process" (Nalimov and Mulchenko, 1969). In scientometrics, scholars have used the publication data to study development patterns and trends for scientific cooperation (Haberi et al., 2019). Bibliographic coupling is used to measure the similarity, like co-citation. It occurs when two works reference an everyday third work in their bibliographies. It has helped to find researchers who have already done this. The concept of bibliographic coupling was first suggested by Kessler in 1963 (Kessler, 1963). The number of shared references cited in the two documents indicates the degree of similarity of the content of the citing papers. A bibliographic coupling network provides different types of analysis, such as authors, sources, countries, organizations, and documents fractional counting Moreover, a citation network is a social network that contains paper sources linked in a co-citation relationship. Co-citation network analysis monitors the number of times two papers are cited in a single article or patient (Small, 1973). The resultant co-citation clusters reflect the subject similarity and highlight the most essential works in the speciality. Based on the citation, this map enables one to visualize how specialities or subfields evolve. The scientometric analysis is widely used in vast numbers of disciplines such as physics (Wang et al., 2021), chemistry (Schummer, 1997) and Medical (Boopathi and Gomathi, 2019). In this study, the author's analysis is in the engineering field of aerospace publications. The authors have employed the scientometric analysis technique to determine the bibliographic coupling, collaboration networks and other analyses based on the study's objectives.

Review of preceding aerospace literature has demonstrated inadequate information and comprehension of the scientometric approach. Despite this, there is only a small quantity of literature on aerospace that does not employ the scientometric technique and measurement of bibliographic coupling and collaborative network analysis. This study results were carried out to evaluate the literature trends and growth in aerospace; it offers quantitative information to determine the trend and development of Aerospace publications. There are vast numbers of publications published related to scientometrics in different fields in biology (Shettar et al., 2023), chemistry (Schummer, 1997), library science (Corda and Liberatore, 2021) and Multidisciplinary (Braun et al., 1995). Gradually, it has been used in aerospace research (Golizadeh et al., 2019) examining the scientometric analysis of remotely piloted aircraft to assess the discipline's current state, strength and weakness. Fifty-nine peer-reviewed journals in the construction domain were systematically reviewed, and the mixed method approach utilized scientometric techniques. Recently, (Qiu et al., 2021) conducted a scientometric-based data analysis on low-carbon air transport development trends and policy implications. In this study, researchers have evaluated the scientific papers and implications of policies, literature mining and cluster analysis are used to understand the trends and development of low-carbon air transport development.

Furthermore, (Bergiante et al., 2015) evaluated the relationship between business model and air transport based on bibliometric analysis, intending to assess the main periodicals, authors, and regions. From the Web of Science database from 1990 to 2012, they conclude that the number of scientific productions has increased. (Aldemir and Sengur, 2017) presented a bibliometric analysis using content analysis of the academic foundation of air transportation research in an emerging country by evaluating a postgraduate thesis at a Turkish university's Turkish Council of Higher Education database for 44 years span from 1972 to 2016. (Pelicioni et al., 2018) utilized an application of a bibliometric tool for studying space technology trends to identify the technological innovation trends pattern in the aerospace sector from the Web of Science database from 2008 to 2015. The authors have mostly used keywords such as space technology, satellite, and space launch vehicles. They conclude that bibliometric study concerns new low-cost technology developments and applied logistics. (Kotsemir, 2019) have focused on the global bibliometric overview of uncrewed aerial vehicles research based on the Scopus database from 1985-2015. Their study explores the major countries, cross-country collaboration links, organizations, and level of citations. The visualization software VOS Viewer was used for plotting the map of international collaboration. (Tanrıverdi et al., 2020) examined the bibliometric and visualization analysis on the Journal of Air Transport Management literature for the future of aviation post-COVID-19 by retrospectively assessing the evolution of air transport. The tool CiteSpace was used for visualization from 2001 to 2019 with 1483 records. The scientists suggest that while the economic crisis in the past Journal of Air Transport Management did not influence the literature, their results also helped solve the industry dealing with the crisis. (Dixit and Jakhar, 2021) studied a review and bibliometric analysis of airport capacity management. The authors found that the aviation sector has dramatically grown, leading to congestion and delays at major airports across the globe. Furthermore, to identify cluster patterns of the authors using co-citation analysis, the findings show that the Journal of Air Transport Management has published 109 documents with 1086 citations. (Yakath Ali et al., 2021) conduct a review and bibliometric-based analysis on four decades of airline productivity and efficiency from 1979 to 2020. Their results concluded that the Journal of Air Transportation Management has contributed a wide range of publications, and data envelopment analysis and stochastic frontier methods are mostly preferred by researchers in their study. (Bakır et al., 2022) have analyzed airport service quality in the bibliometric method; their study reveals that airports have evolved in business centres for four decades and insists that service quality is difficult to maintain. The authors used R-based bibliometric software to analyse the Web of Science database indexed 100 studies from 1975 to 2020. The Journal of Air Transport Management is extremely involved in publications, and China is the country that contributed high publications. In collaboration networks, service quality research has contributed to a wide range. The systematic review method (Ginieis et al., (2012) explores the systematic literature review methodology on the academic journal literature on air transport. To examine the changing interests of academics publishing in air transportation, 1059 articles were published from 1997 to 2009. Air transportation journal has identified the most productive journal in their study. (Da Rocha et al., 2022) assessed a systematic review and bibliometric analysis of trends and challenges in assessing quality of service at airport terminals; the study was conducted based on the Scopus and Web of Science databases. Out of 565 articles, 61 articles were selected for in-depth analysis. Findings and discussions are focused on countries, airport areas, evaluation profiles, methods and criteria. The authors can identify the gaps and understanding of aerospace publications from the existing literature. To fill the gaps, the study was conducted using a scientometric approach. The main objectives of the scientometric analysis are to scrutinize the bibliographic coupling and collaboration networks between authors, documents and countries, and other objectives are to analyse the scientometric indicators such as year-wise publications, annual growth rate, citation analysis, H-index analysis, find out the prolific authors, average citations per publications, productive countries contribution, journal publications and its impact, mostly cited documents, document types-wise publications, funding agencies, and institutions-wise publications.

2. METHODOLOGY

The required data for the scientometric study has been retrieved from the Institute for Scientific Information's Web of Science database (WoS), the world's leading scientific citation search and analytical information platform. In the document search, the search strategy "Aerospace" applied “TITLE-ABS-KEY” as a keyword for retrieving required data, and the period was from 01-01-2013 to 31-12-2022, a decade of study. A total of 20250 published bibliographic data was retrieved in plain text format for the analysis. The collected data was analyzed using Bibexcel and Histcite software, then transferred to Microsoft Word and Excel for further

statistical analysis based on the study's objectives. Further analysis was done using VOSviewer visualization software for bibliographic coupling and collaborative network analysis. The data from the analysis carried out are available at: https://zenodo.org/records/10663289

3. RESULTS AND DISCUSSION

3.1. Year-wise publications, annual growth rate, Citations and H-index

Table 1. Year-wise publications, annual growth rate, Citations and H-index

Year	Publications	Cumulative	World share	Cumulative %	AGR	Citations	H-index
2013	965	965	4.76	4.76		32991	79
2014	1043	2008	5.15	9.91	8.08	35174	81
2015	1157	3165	5.71	15.62	10.93	36760	84
2016	1342	4507	6.62	22.25	15.98	42705	93
2017	1624	6131	8.01	30.27	21.01	44836	86
2018	1870	8001	9.23	39.51	15.14	46290	85
2019	2325	10326	11.48	50.99	24.33	44156	85
2020	2666	12992	13.16	64.15	14.66	40999	72
2021	3305	16297	16.34	80.47	23.96	30746	55
2022	3953	20250	19.54	100	19.6	12837	33
Total	20250		100				

Notes: AGR: Annual growth rate

Table 1 represents the publications and related metrics from 2013 to 2022 over ten years. In 2013, there were 965(4.76%) publications of the global total, and the number of publications increased annually, reaching its peak at 3953(19.54%) in 2022. The annual growth rate represents that the highest AGR was observed in 2019, at 24.33%, indicating a substantial increase in publications that year. The AGR has fluctuated over the years. The highest number of citations, 46290, was recorded in 2018 as the H-index measures research impact, indicating the number of publications (H) that have received at least H citations. The H-index ranged from 33 in 2022 to 93 in 2016, with variations over the years. The table illustrates a consistent publication growth over the ten years, with varying rates of annual growth and research impact, as mentioned by citations and the H-index. The data reveals that the body of the work in this table has substantially impacted aerospace publications, as indicated by the increasing number of citations over the years.

3.2. Prolific authors in aerospace publications

Table 2. Prolific authors in aerospace publications

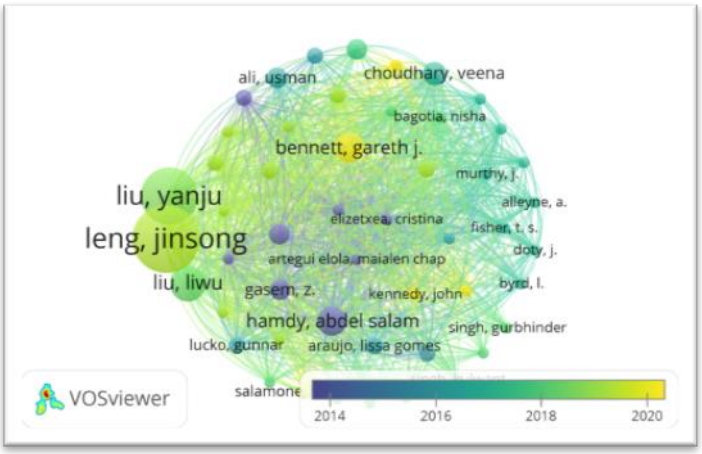
S. No	Author	Total Publications	Percentage	Total citations	H-index	ACPP = TC/TP
1	Wang J	146	0.72	2216	26	15.18
2	Li Y	142	0.701	1792	23	12.62
3	Zhang Y	131	0.646	2038	23	15.56
4	Wang Y	121	0.597	2456	24	20.30
5	Zhang H	108	0.533	1747	23	16.17
6	Wang H	107	0.528	1779	22	16.63
7	Liu Y	107	0.528	1568	20	14.65
8	Wang B	104	0.513	2193	24	21.09

9	Wang L	96	0.474	1492	19	15.55
10	Liu J	92	0.454	2916	23	31.70
11	Li J	92	0.454	2916	23	31.70
12	Li A	90	0.444	1608	17	17.87
13	Chen Y	88	0.434	1448	19	16.46
14	Li H	87	0.429	1564	23	17.98
15	Zhang J	85	0.419	1245	21	14.65
16	Li L	83	0.409	1125	18	13.56
17	Zhang L	82	0.404	888	16	19.82
18	Zhang X	78	0.385	1253	21	16.08
19	Zhang C	75	0.37	1287	18	17.16
20	Yang Y	71	0.35	1061	16	14.96

Notes: ACPP: Average citations per publications; TC: Total citations; TP: Total papers

Table 2 lists the top 20 authors based on their total number of publications; author "Wang J" has the highest number of publications (146) and the highest ACPP (15.18), indicating a significant research output with a substantial citation impact. Authors "Liu J" and "Li J" share the same number of publications (92) and have the highest ACPP (31.70), suggesting their work has been highly influential and widely cited. Author "Wang Y" has a relatively high ACPP (20.30), indicating that their publications are, on average, cited more frequently compared to others. The table provides a snapshot of the productivity and impact of these authors within the aerospace publications, helping to identify influential researchers based on their publications and citation records.

Figure 1. Author's bibliographic coupling



3.3. Collaborative authorship network (between top 20 authors)

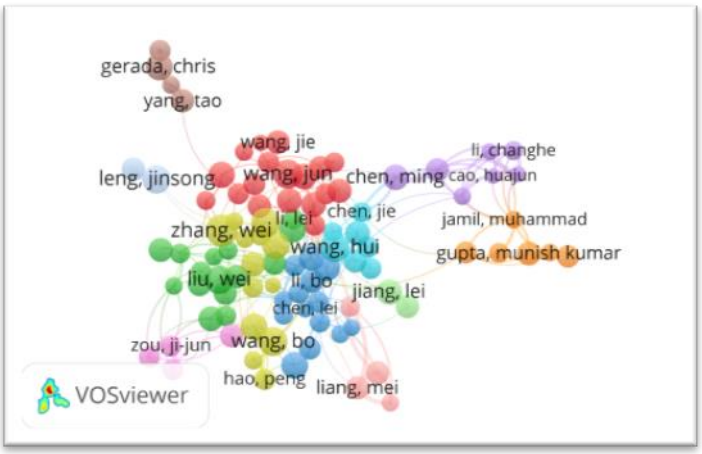
Table 3. Collaborative authorship network (between top 20 authors)

S. No	Author	Collaborate with	Publications	Percentage
1	Li J	Zhang Y	12	0.059
2	Zhang J	Zhang Y	11	0.054
3	Li J	Li Y	11	0.054
4	Li Y	Wang Y	11	0.054
5	Li Y	Zhang J	11	0.054

6	Wang Z	Zhang X	11	0.054
7	Liu Y	Zhang Z	10	0.049
8	Yang Y	Zhang Z	10	0.049
9	Li J	Liu J	10	0.049
10	Wang X	Wang Z	10	0.049
11	Li Y	Zhang Z	10	0.049
12	Liu J	Zhang Y	10	0.049
13	Chen Y	Wang Z	10	0.049
14	Wang Z	Zhang Z	10	0.049
15	Wang H	Wang Z	10	0.049
16	Zhang J	Zhang Z	10	0.049
17	Liu J	Wang Z	10	0.049
18	Li J	Zhang Z	9	0.044
19	Liu Y	Wang H	9	0.044
20	Yang Y	Zhang C	9	0.044

This table provides insight into collaborative research efforts among authors. The author "Li J" has the highest number of collaborative publications with "Zhang Y," indicating a significant research partnership resulting in 12 joint publications. This collaboration accounts for 0.059% of "LI J's total publications. Several authors have collaborated on ten publications each, such as "LIU Y" and "Zhang Z," "Yang Y" and "Zhang Z," and others. These collaborations make up 0.049% of their respective total publications. The table sheds light on the collaborative research within the group of authors. It provides a quantitative measure of their collaborative efforts through the number of publications and the proportion of each author's overall output contributed by these collaborations.

Figure 2. Collaborative-authorship networks



3.4. Country-wise publications (G20 countries)

Table 4. Country-wise publications (G20 countries)

S. No	Country	Publications	Percentage	Citations	H-index
1	Peoples R China	7421	36.64	120462	122
2	USA	3397	16.77	86873	121
3	India	2140	10.56	34356	76
4	UK	1850	9.13	45023	89
5	Germany	1154	5.69	25541	69

6	Italy	972	4.8	20216	59
7	France	754	3..72	17430	64
8	Canada	712	3.51	15012	59
9	Australia	552	2.72	21900	66
10	South Korea	545	2.69	7234	39
11	Japan	518	2.55	10044	45
12	Brazil	426	2.25	2014	32
13	Turkey	435	2.14	7857	38
14	Russia	296	1.46	3852	29
15	Saudi Arabia	291	1.43	4979	34
16	South Africa	133	0.65	2743	24
17	Austria	124	0.61	2797	27
18	Argentina	20	0.09	517	11
19	Indonesia	13	0.06	100	6
20	European countries	10	0.04	75	4

Table 4 represents an overview of research output and impact regarding publications, citations, and H-index for G20 countries. "People's Republic of China" leads in the number of publications, 7421, and the percentage share of total publications is 36.64. It also has the highest H-index, 122. The "USA" follows closely with 3397 publications, 16.77% of the total and a high H-index of 121." India" ranks third in terms of the number of publications, 2140, contributing 10.56% of the total, but with a lower H-index of 76. The "UK" and "Germany" also have notable publication numbers and research impact. Smaller economies within the G20, such as "Argentina," "Indonesia," and "European countries," have lower publication numbers and research impact, which is reflected in their lower percentages and H-indices. This table provides valuable insights into the research productivity and impact of G20 countries, helping to assess their contributions to their global research landscape.

Figure 3. Bibliographic coupling of countries

3.5. Collaborative countries (between 20 countries)

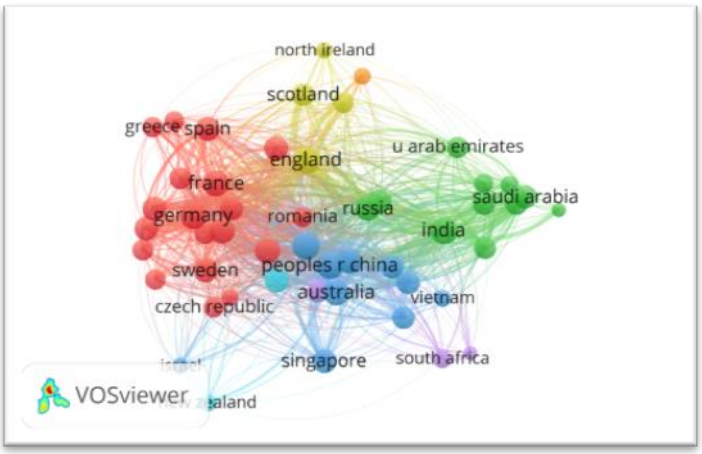
Table 5. Collaborative countries (between 20 countries)

S. No	Country	Collaborate with	Publications	Percentage
1	Peoples R China	USA	403	1.99
2	Peoples R China	UK	368	1.817
3	Australia	Peoples R China	164	0.809

4	Germany	USA	145	0.716
5	UK	USA	143	0.706
6	Germany	UK	119	0.587
7	Germany	Peoples R China	109	0.538
8	Canada	Peoples R China	107	0.528
9	Peoples R China	Singapore	105	0.518
10	India	UK	89	0.439
11	Italy	UK	88	0.434
12	Italy	USA	86	0.424
13	Japan	USA	86	0.424
14	Canada	USA	85	0.419
15	France	USA	81	0.395
16	France	UK	81	0.395
17	India	USA	75	0.37
18	Germany	Italy	74	0.365
19	India	Saudi Arabia	72	0.355
20	France	Peoples R China	71	0.35

Table 5 provides insights into international research collaboration between various countries based on the number of publications resulting from these collaborations. Notably, the People's Republic of China emerged as a central player in international research collaboration, with its highest number of collaborations being with the United States (403 publications) and the United Kingdom (368 publications). The United States, on the other hand, tops the list in terms of the number of collaborations with China and Germany, with 403 and 145 publications, respectively. Australia collaborates significantly with China, and Germany and the United Kingdom maintain robust research connections with the United States and China. Several other collaborations, such as India's collaboration with the United Kingdom and the United States, are also noteworthy. These collaborations underscore India's increasing participation in the global research network. Understanding these collaborations can aid policymakers, researchers, and institutions in fostering more productive and impactful partnerships to advance knowledge and address global challenges effectively.

Figure 4. Collaborative-countries network visualization



3.6. Journals-wise publications

Table 6. Journals-wise publications

S.	Journal	Publications	%	Citatio	H-	Impact

No				ns	index	Factor (IF)
1	International Journal Of Advanced Manufacturing Technology	744	3.67	11897	47	3.4
2	Materials	415	2.04	4346	33	4.5
3	Composite Structures	323	1.59	7410	43	6.3
4	Ieee Access	288	1.42	1521	17	3.9
5	Metals	225	1.11	2310	21	2.69
6	Materials Science And Engineering A-Structural Materials Properties Microstructure And Processing	216	1.06	6725	44	6.4
7	Composites Part B-Engineering	211	1.04	13672	48	13.1
8	Applied Sciences-Basel	199	0.98	1931	21	2.7
9	Journal Of Manufacturing Processes	193	0.95	4157	33	6.2
10	Aerospace Science And Technology	189	0.93	3245	32	5.6
11	Sensors	182	0.89	2934	26	3.9
12	Acta Astronautica	179	0.88	3178	26	3.5
13	Journal Of Alloys And Compounds	171	0.84	4713	36	6.2
14	Materials & Design	169	0.83	11474	53	8.4
15	Journal Of Materials Engineering And Performance	162	0.8	1222	18	2.3
16	Polymers	144	0.71	176	18	4.6
17	Ceramics International	139	0.68	2084	25	5.2
18	Composites Science And Technology	138	0.68	3885	35	9.1
19	Aiaa Journal	136	0.67	1256	19	2.5
20	Acta Metallurgica Sinica	129	0.63	614	12	3.5

The table shows the landscape of academic publications in the field of aerospace. It presents data on the number of publications, the percentage of total publications, citations, H-index, and Impact factor (IF) for the top 20 journals in the domain. This analysis helps to understand the significance and influence of these journals within the research community. The International Journal of Advanced Manufacturing Technology leads the list with 744 publications. This journal boasts a substantial share of the total publications, 3.67% and a commendable H-index of 47, indicating its influential position in the field. Consequently. Materials with 415 publications and 4.5 impact factor. Composite Structures with 323 publications and a relatively high impact factor of 6.3. Furthermore, the remaining journals contribute meaningfully to the field, with varying publication counts, citations, H-index, and impact factors. This table showcases the diversity of journals in the field of Aerospace. Researchers and institutions can use this information to identify critical publications and prioritise their contributions to these influential journals.

3.7. Mostly cited documents

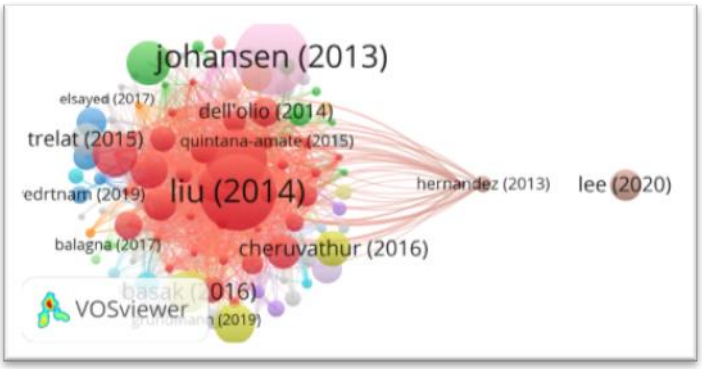
Table 7. Mostly cited documents

S. No	Cited document	Cited counts
1	Dursun T, 2014, V56, P862, Mater Design	56
2	Rioja RJ, 2012, V43A, P3325, Metall Mater Trans A	44
3	Debroy T, 2018, V92, P112, Prog Mater Sci	32
4	Debroy T, 2018, V92, P112, Prog Mater Sci	31
5	Frazier WE, 2014, V23, P1917, J Mater Eng Perform	31
6	Dursun T, 2014, V56, P862, Mater Design	29

7	Frazier WE, 2014, V23, P1917, J Mater Eng Perform	29
8	Debroy T, 2018, V92, P112, Prog Mater Sci	27
9	Gu DD, 2012, V57, P133, Int Mater Rev	25
10	Gu DD, 2012, V57, P133, Int Mater Rev	21
11	Frazier WE, 2014, V23, P1917, J Mater Eng Perform	19
12	Debroy T, 2018, V92, P112, Prog Mater Sci	18
13	Debroy T, 2018, V92, P112, Prog Mater Sci	18
14	Herzog D, 2016, V117, P371, Acta Mater	17
15	Frazier WE, 2014, V23, P1917, J Mater Eng Perform	15
16	Banerjee D, 2013, V61, P844, Acta Mater	14
17	Banerjee D, 2013, V61, P844, Acta Mater	14
18	Boyer RR, 1996, V213, P103, Mat Sci Eng A-Struct	12
19	Ngo TD, 2018, V143, P172, Compos Part B-Eng	10
20	Herzog D, 2016, V117, P371, Acta Mater	9

This table represents the most frequently cited documents within the aerospace field... The data includes the titles of the cited documents, the number of times each document has been cited, and the respective source journal. Topping the list is the work by Dursun T, published in 2014 in “Material Design”, cited a remarkable 56 times. It suggests that that particular document has played a pivotal role in shaping research and discussions within the field. The document authored by Rioja RJ in 2012, published in “Metallurgical and Materials Transactions A,” is the second most cited within 44 citations, underscoring its significance in the metallurgical and materials science community. Followed by Debroy T, 2018, Progress in Material Science cited by 32 times. The remaining documents in the list also exhibit significant citation counts, ranging from 21 to 9 citations. This table showcases the influence and enduring relevance of the specific documents within the field. Researchers and scholars often turn to these works as fundamental references and sources of inspiration for their research endeavours.

Figure 5. Mostly cited documents bibliographic coupling



3.8. Document type-wise publications

Table 8. Document type-wise publications

S. No	Document	Publications	Percentage	Citations	H-index
1	Article	17285	85.36	274937	149
2	Review	1675	8.28	83648	136
3	Article; Proceedings Paper	513	2.54	7648	40
4	Editorial Material	297	1.49	534	10
5	Article: Early Access	275	1.28	418	8

6	Review: Book Chapter	8	0.03	839	5
7	Review: Early Access	20	0.10	76	4
8	Article; Retracted Publication	3	0.02	31	3
9	Article; Book Chapter	3	0.02	133	3
10	Letter	7	0.04	12	2
11	News Item	65	0.33	1	1
12	Meeting Abstract	56	0.28	4	1
13	Reprint	1	0.005	2	1
14	Book Review	13	0.07	2	1
15	Correction	19	0.10	4	1
16	Biographical-Item	7	0.04	0	0
17	Art Exhibit Review	1	0.005	0	0
18	Meeting	1	0.005	0	0
19	Correction: Early Access	1	0.005	0	0
	Total	20250	100		

This table illustrates the distribution of publications based on the document types in the Aerospace research domain. Articles comprise the majority of publications, accounting for 85.36% (17,285). These are the cornerstone of scholarly communication, with a substantial citation count of 274,937 and a robust H-index of 149. Reviews represent 8.28% of the publications (1,675) and are critical in summarizing and evaluating existing research. Despite being a smaller percentage, reviews garner significant attention, with 83,648 citations and an H-index of 136, indicating their impact on the field. This hybrid category constitutes 2.54% of publications (513). These publications bridge the gap between standard articles and proceedings papers, with 7,648 citations and an H-index of 40, reflecting their importance in conference-related research. Followed by Editorial materials contribute 1.49% of publications (297), and other document types, such as "Article; Early Access," "Review; Book Chapter," and "Review; Early Access," "Biographical-Item," "Art Exhibit Review," "Meeting," each with its unique role and impact. Researchers and institutions should consider this diversity when conducting literature reviews and understanding the significance of different document types in the research ecosystem.

3.9. Funding Agency

Table 9. Funding Agency

S. No	Funding Agency	Publications	Citations	H-index
1	Natural Sciences and Engineering Research Council of Canada (NSERC)	20	250	9
2	Office of Naval Research [N00014-10-1-0988]	8	350	8
3	National Research Foundation (NRF) Singapore under the Corp Lab@University Scheme	6	74	5
4	European Union [685594]	6	185	5
5	European Community [282522]	6	252	5
6	Ministry of Industry and Trade of the Czech Republic	8	63	5
7	Natural Sciences and Engineering Research Council of Canada	6	114	5
8	Projekt DEAL	10	46	5
9	Science Foundation Ireland [15/RP/2773]	6	46	5
10	CNPq; CAPES; FAPERJ	4	48	4
11	China Scholarship Council	6	119	4
12	China Scholarship Council (CSC) [20130623009	4	239	4

	1]			
13	EPSRC	4	39	4
14	National Natural Science Foundation of China [51772027]	4	47	4
15	NASA	7	303	4
16	French Ministry of Industry	5	186	4
17	National Natural Science Foundation of China [51505291]	4	73	4
18	Boeing Company	7	39	4
19	Rolls-Royce plc	6	175	4
20	Natural Sciences and Engineering Research Council (NSERC) of Canada	5	43	4

This table provides insights into the impact and contributions of various funding agencies in Aerospace research. This analysis helps to understand the influence of different funding organizations in shaping research outcomes. The Natural Sciences and Engineering Research Council of Canada (NSERC is a prominent funding agency with 20 publications and a significant citation count of 250, resulting in an H-index of 9. Office of Naval Research (ONR), under the grant N00014-10-1-0988, has eight publications with a remarkable citation count of 350, resulting in an H-index of 8. It indicates the substantial impact of ONR-funded research, particularly in naval and maritime studies. National Research Foundation (NRF) Singapore, through the Corp Lab@University Scheme, has funded six publications with 74 citations and an H-index of 5, showcasing its support for research initiatives in Singapore. This table underscores the crucial role played by funding agencies in driving and facilitating research. The number of publications, citation counts, and H-index values reflect the impact and effectiveness of these organizations in supporting and promoting valuable research initiatives. Researchers and institutions often rely on funding from these agencies to conduct their studies and make significant contributions to their respective fields.

3.10. Institution wise-publications

Table 10. Institution wise-publications

S. No	Institution	Publications	Percentage	TLCS	TGCS
1	Chinese Academy Science	556	2.7	271	9456
2	Harbin Institute of Technology	539	2.6	392	8028
3	Northwestern Polytechnic University	453	2.2	464	9921
4	Beihang University	439	2.1	510	7309
5	Nanjing University Aeronaut & Astronaut	380	1.8	302	5747
6	Unknown	294	1.4	8	200
7	Xi An Jiao Tong University	262	1.3	189	5728
8	Shanghai Jiao Tong University	247	1.2	267	5116
9	University of Chinese Academy Science	229	1.1	84	3365
10	Dalian University of Technology	227	1.1	161	3329
11	NASA	226	1.1	205	4971
12	Tsinghua University	221	1.1	123	4368
13	Beijing Institute of Technology	199	1	113	4030
14	Huazhong University of Science & Technology	196	0.9	142	3878
15	National Institute of Technology	188	0.9	183	3306
16	German Aerospace Centre DLR	182	0.9	111	3244
17	University Nottingham	164	0.8	269	5004
18	National University of Defense Technology	162	0.8	179	3100
19	Cranfield University	159	0.8	212	4934

20	Japan Aerospace Exploration Agency	156	0.8	110	433

Notes: TLCS: Total local citation score; TGCS: Total global citation score

Table 10 reveals the contributions of various institutions in the field of Aerospace. It has been assessed based on the number of publications, the percentage of total publications, and its respective Total Local Citation Score (TLCS) and Total Global Citation Score (TGCS) values. The "Chinese Academy of Sciences" is the top contributor with 556 publications, representing 2.7% of total publications. It has a TLCS value of 271 and a TGCS value of 9,456. The "Harbin Institute of Technology" follows closely with 539 publications (2.6% of the total), emphasizing its research strength and impact. It boasts a TLCS of 392 and a TGCS of 8,028. Chinese Universities: Several Chinese universities, including "Northwestern Polytechnic University," "Beihang University," "Nanjing University Aeronautics and Astronautics," "Xi'an Jiao Tong University," and "Shanghai Jiao Tong University," have made substantial contributions, collectively representing a significant portion of the publications. This table highlights the diverse landscape of institutions contributing to the research. Researchers, policymakers, and academic institutions can use this information to identify potential collaborators, assess research impact, and foster partnerships that promote further advancements in the field.

The study's findings show that the year-wise publications increased from 2013(965) to 2022(3953), and the world share of the publications also shows a 4.76 to 19.54 growing trend. The annual growth rate fluctuated from 8.08 to 21.01, 15.14 to 24.33, 14.66 to 23.96 and then 19.6; the highest annual growth was identified in 2019 with 24.33. In 2018, publications were cited 46290 times, and the highest number of citations was obtained this year, and in 2016, a considerable amount of H-index 93 than other years. The prolific author of the study is Wang J. He has published 146 publications with 0.72%; his citations, H-index and ACPP are 2216, 26 and 15.18, respectively. Followed by LI Y, Zhang Y, and Wang Y have published 142(0.701%), 131(0.646%), and 121(0.597%) documents with second, third, and fourth positions. Moreover, the collaborative authorship network shows that the authors LI J and Zhang Y have collaboratively published 12(0.059%) publications; consequently, Zhang J, Zhang Y, Wang Z Zhang X have published 11(0.054%) publications, respectively. Peoples R China is a country with many publications, 7421(36.54%). Furthermore, it has identified a most cited country 120462 times and an H-index of 122. USA and India is the country with the second and third place in aerospace publications with a publications count of 3392(16.77) and 2140(10.56%) records; it has cited 86873 and 34356 times with H-index count of 121 and 76. Peoples R China has collaborated with the US, UK and Singapore, publishing 403(1.99%), 368(1.817%) and 105(0.518%), respectively. UK and Germany collaborate with the USA, and India collaborates with the UK, USA and Singapore. International Journal of Advanced Manufacturing Technology has published 744(3.67%) documents, cited 11897 times and 47 H-index. The document of Duesun T, 2014, V56, P862, Mater Design, is highly cited by authors with a time of 56. In the forms of publications, authors have published in Article 17285(85.36%)., The National Science and Engineering Research Council of Canada (NSERC) plays a significant role in aerospace publication funding; it has produced 20 publications, with a citation count of 250 with 9 H-index. Chinese Academy of Science is one of the institutions that have produced 556(2.7%) publications, with global citations of 9456.

4. CONCLUSION

Over the past decade, aerospace publications have shown a significant growth trend from 2013 to 2022. The authors have evaluated the collaborative network analysis between authors and countries. These collaborative networks have indicated the collaborations of different authors and countries, and with the collaborations, the authors and countries have produced more potential publications. Using bibliographic coupling, the authors have identified the different clusters and connections between authors and countries. The scientometric analysis of aerospace publications explores various scientometric indicators; from this statistical analysis, the authors conclude that aerospace publications have seen exponential growth. The collaborative network analysis and bibliographic coupling analysis can be helpful to aerospace professionals, managers, planners, Policy makers, researchers, practitioners, information scientists, and librarians to identify the different collaboration countries and authors in aerospace publications. The authors have suggested that further analysis

will be conducted using the social network analysis method to know the different networks in aerospace publications.

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