



DSIAC TECHNICAL INQUIRY (TI) RESPONSE REPORT

Top Global Researchers and Organizations in Hypersonics

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ABOUT DSIAC

The Defense Systems Information Analysis Center (DSIAC) is a U.S. Department of Defense information analysis center sponsored by the Defense Technical Information Center. DSIAC is operated by SURVICE Engineering Company under contract FA8075-14-D-0001.

DSIAC serves as the national clearinghouse for worldwide scientific and technical information for weapon systems; survivability and vulnerability; reliability, maintainability, quality, supportability, and interoperability; advanced materials; military sensing; autonomous systems; energetics; directed energy; and non-lethal weapons. We collect, analyze, synthesize, and disseminate related technical information and data for each of these focus areas.

A chief service of DSIAC is free technical inquiry (TI) research, limited to 4 research hours per inquiry. This TI response report summarizes the research findings of one such inquiry. For more information about DSIAC and our TI service, please visit www.DSIAC.org.

ABSTRACT

The Defense Systems Information Analysis Center (DSIAC) received a technical inquiry requesting a search of available databases to identify the top global researchers and organizations in hypersonics. DSIAC staff searched multiple literature databases, including Scopus and Web of Science (WoS), to provide information on the publications, number of citations, patents awarded, and pending patents held in hypersonics technology and research development. Four different lists of the top 10 global researchers and affiliations were compiled based on patents awarded, patents pending, and Scopus and WoS database publications and citations.

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1.0 TI Request

1.1 INQUIRY

Who are the leading global researchers in hypersonics technology?

1.2 DESCRIPTION

The inquirer asked the Defense Systems Information Analysis Center (DSIAC) to search available resources to identify the top 10 global researchers and organizations in hypersonics.

2.0 TI Response

DSIAC completed literature searches for publications and patent information on hypersonics via the Scopus and Derwent Innovation databases. DSIAC used the search terms “hypersonics,” “hypersonics research,” and “hypersonic research OR technology.” The searches were limited to the past 3 years so that the results would reflect the most recent research. The results across all searches are compiled in Table 1.

Table 1: Top Researchers Across All Searches

Researcher	No. of Patents Granted	No. of Patents Pending	No. of Scopus Publications	No. of WoS Publications
You, Yancheng	31	6	—	—
Xu, Xiaobin	19	—	—	—
Li, Yi-Qing	19	—	—	—
Tan, Hui-Jan	18	—	—	—
Zhu, Tao	16	—	—	—
Liu, Jun	16	—	20	22
Wang, Lei	16	—	—	—
Jiang, Pei-Xue	15	—	—	—
Wang, Xiao-Jun	15	—	—	—
Wang, Guo-Hong	13	—	—	—
Xu, Bin	—	10	—	—
Wang, Yi	—	8	—	—
Wang, Yu-Hui	—	8	—	—
Luo, Jin-Ling	—	8	—	—
Fan, Xiao-Qiang	—	7	—	—
Wu, Qing-Xian	—	7	—	—
Chen, Mou	—	6	—	—

Table 1: Top Researchers Across All Searches (Continued)

Researcher	No. of Patents Granted	No. of Patents Pending	No. of Scopus Publications	No. of WoS Publications
Li, Jia-Wei	—	6	—	—
Tang, Ji-Bin	—	6	—	—
Yan, Chongnian	—	—	36	25
Huang, Wei	—	—	27	27
Tang, Guojian	—	—	26	—
Boyd, Iain D.	—	—	25	—
Candler, Graham V.	—	—	24	—
Zhou, Jun	—	—	24	18
Bu, Xiang-Wei	—	—	21	24
Yan, Li	—	—	19	19
Kimmel, Roger	—	—	18	—
Bao, Wen	—	—	—	23
Chang, Juntao	—	—	—	19
Yu, Daren	—	—	—	18
Zong, Q.	—	—	—	17

Note: WoS = Web of Science.

The following results are provided in Sections 2.1 and 2.2:

- Top researchers and organizations based on the number of patents awarded in hypersonics research.
- Top researchers and organizations based on patents pending.
- Research and patent trends among top countries performing hypersonics research.
- Top researchers and organizations based on the number of publications and citations found in Scopus.
- Top researchers and organizations found in the WoS database.

A spreadsheet containing patent information for the top results found in Derwent Innovations was exported and delivered to the inquirer for further review.

2.1 TOP RESEARCHERS/ORGANIZATIONS BASED ON PATENTS

The Derwent Innovation database, part of Clarivate Analytics, was used to search for global researchers in hypersonics based on the number of granted (awarded) patents and pending patent applications. Searches were performed using the terms “hypersonic AND (research OR technology)” and “hypersonic.”

The search parameters included patents granted in 2016 to present day and alive and indeterminate patents. The search term “hypersonic” was very general and returned a larger, more accurate depiction of global researchers in the overarching area of hypersonics. The total number of hits was 969, and 478 (i.e., 51%) of the patents are from the top 10 organizations (shown in Table 2).

Table 2: Top 10 Organizations Based on Patents Granted

Organization	No. of Patents Granted per Organization	Top Researcher(s)	No. of Patents per Researcher
University of Nanjing Aeronautics and Astronautics	90	Tan, Hui-Jan	18
		Wang, Lei	16
CenNavi Technologies Co. Ltd. – China Academy of Aerospace Aerodynamics	90	Cheng, Xing	11
		Wang, Yu-Dong	8
The Boeing Company	50	Embler, Jonathan	15
Academy of Military Sciences at the National University of Defense Technology	50	Liu, Jun	16
University of Beijing Aeronautics and Astronautics (Beihang University)	50	Wang, Xiao-Jun	15
University of Xiamen	35	You, Yancheng	31
		Li, Yi-Qing	19
China Aerodynamics Research and Development Center	33	Xu, Xiaobin	19
		Zhu, Tao	16
		Lin, Jing-Zhou	14
Raytheon	28	—	—
University of Northwestern Polytechnical	28	Xu, Bin	11
Tsinghua University	24	Jiang, Pei-Xue	15

Several of the researchers identified in bold are also identified in descending order in Table 3, where the top 10 researchers hold 178 patents, or 18% of the total patents.

Several of the researchers identified in bold Table 2 and are also identified in descending order in Table 3. The top ten researchers, shown in Table 3, hold 178 patents, or 18% of the total patents found via the search.

Table 3: Top 10 Researchers Based on Patents Granted

Researcher	No. of Patents Granted	Affiliation
You, Yancheng	31	University of Xiamen
Xu, Xiaobin	19	China Aerodynamics Research and Development Center
Li, Yi-Qing	19	University of Xiamen
Tan, Hui-Jan	18	University of Nanjing Aeronautics and Astronautics
Zhu, Tao	16	China Aerodynamics Research and Development Center
Liu, Jun	16	Academy of Military Sciences
Wang, Lei	16	University of Nanjing Aeronautics and Astronautics
Jiang, Pei-Xue	15	Tsinghua University
Wang, Xiao-Jun	15	University of Beijing Aeronautics and Astronautics (Beihang University)
Lin, Jing-Zhou	14	China Aerodynamics Research and Development Center

China, the United States, and Russia are the top patent holders in hypersonics research. Based on data from Derwent, the number of patents issued in each country from 2016 to 2019 has increased each year, suggesting hypersonics research is on the rise (shown in Figure 1).

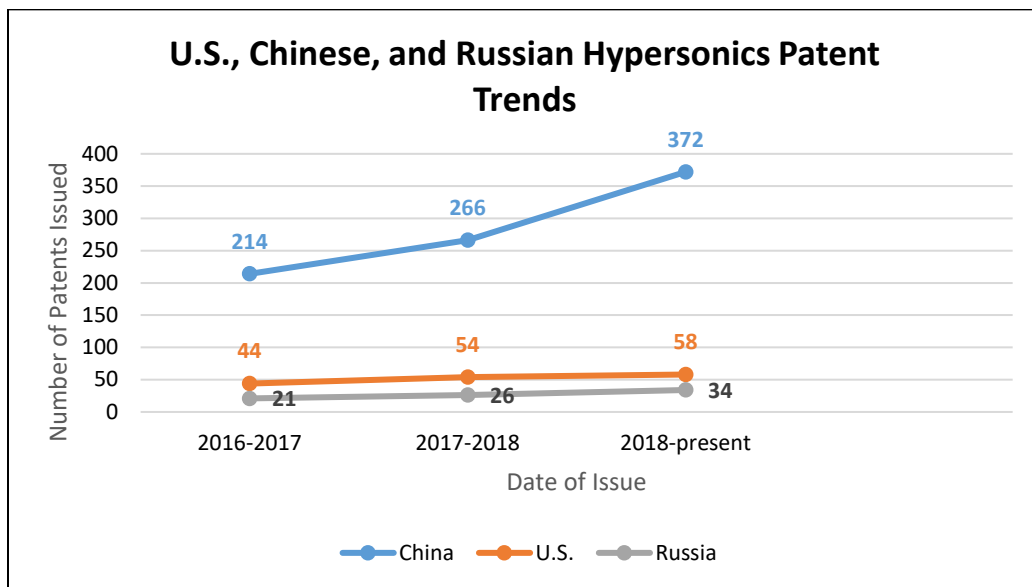


Figure 1: Graph of U.S., Chinese, and Russian Patent Trends.

The top researchers and their affiliations based on the number of pending hypersonics patent applications without grants is shown in Table 4. Using the term “hypersonic,” the search was limited to alive and indeterminate patents from 2016 to present. Indeterminate patents were included because it was unclear whether they were dead or alive.

Table 4: Top Researchers Based on Pending Patents

Researcher	No. of Pending Patents	Affiliation
Xu, Bin	10	University of Northwestern Polytechnical
Wang, Yi	8	Academy of Military Medical Sciences at the National University of Defense Technology
Wang, Yu-Hui	8	University of Nanjing Aeronautics and Astronautics
Luo, Jin-Ling	8	Beijing Kongtian Technology Research Institute
Fan, Xiao-Qiang	7	Academy of Military Medical Sciences at the National University of Defense Technology
Wu, Qing-Xian	7	University of Nanjing Aeronautics and Astronautics
You, Yancheng	6	Xiamen University
Chen, Mou	6	University of Nanjing Aeronautics and Astronautics
Li, Jia-Wei	6	University of Nanjing Aeronautics and Astronautics
Tang, Ji-Bin	6	<ul style="list-style-type: none"> • CenNavi Technologies Co. Ltd <ul style="list-style-type: none"> – China Academy of Aerospace and Aerodynamics • Beijing Kongtian Technology Research Institute • Tsinghua University

2.2 TOP RESEARCHERS/ORGANIZATIONS BASED ON PUBLICATIONS AND CITATIONS

2.2.1 Scopus Search Results

DSIAC also used Scopus, a literature database, to search for researchers and organizations working in hypersonics and patents related to hypersonics. Scopus is the largest curated abstract and citation database of peer-reviewed literature containing over 71 million records, 23,000 peer-reviewed journals, and more than 166,000 books. Scopus uses sophisticated search tools that can search by document, author, or affiliation and can refine results by source type, year, language, author, affiliation, and more. As with other search engines, Boolean logic can narrow the number of citations to more relevant results. Scopus also contains hundreds of thousands of engineering conference papers not covered in alternative databases [1].

Using the term “hypersonic,” the Scopus search was limited to conference proceedings and journal articles from 2016 to present. The top 10 organizations are shown in Table 5, and the top 10 researchers are shown in Table 6. The rankings are based on number of publications and citations per organization/researcher. The h-index metric is also included as an attempt to measure the productivity and citation impact of the publications of the researchers. The h-index is based on an author’s number of publications and citations to provide an estimate of

the importance and impact of his/her research contributions. The h-index means a researcher has index h if h of his/her publications have at least h citations each. For example, an h-index of 15 means that 15 of the author's publications have received at least 15 citations each. The higher the h-index, the more credible the research.

Table 5: Top 10 Organizations Based on the Number of Publications

Organization	No. of Documents	Top Researcher(s)	No. of Documents	No. of Citations	h-Index
Beihang University	237	Yan, Chongnian	36	95	10
Northwestern Polytechnical University	212	Zhou, Jun	24	37	10
National University of Defense Technology	195	Huang, Wei	27	302	31
		Tang, Guojian	26	24	14
		Yan, Li	19	320	20
Nanjing University of Aeronautics and Astronautics	184	Liu, Yanbin	14	13	6
China Aerodynamics Research and Development Center	157	Gui, Yewei	13	9	8
Harbin Institute of Technology	143	Qin, Jiang	17	57	19
Chinese Academy of Sciences	102	Yi, Jianqiang	18	42	28
Wright-Patterson Air Force Base	97	Kimmel, Roger	18	53	23
China Academy of Aerospace Aerodynamics	97	Liu, Chuanzhen	9	10	3
Air Force Engineering University, China	73	Bu, Xiang-Wei	21	247	14

Seven of the top researchers identified in bold in Table 5 are also identified in descending order in Table 6 as top researchers overall.

Table 6: Top 10 Researchers Based on Scopus Publications and Citations

Researcher	Affiliation	No. of Documents	No. of Citations	h-Index
Yan, Chongnian	Beihang University	36	97	10
Huang, Wei	National University of Defense Technology – Academy of Military Medical Sciences	27	302	31
Tang, Guojian	National University of Defense Technology – Academy of Military Medical Sciences	26	24	14
Boyd, Iain D.	University of Michigan, Ann Arbor	25	117	47
Candler, Graham V.	University of Minnesota Twin Cities	24	56	40
Zhou, Jun	Northwestern Polytechnical University	24	37	10
Bu, Xiang-Wei	Air Force Engineering University, China	21	247	14
Liu, Jun	Dalian University of Technology, China	20	87	18
Yan, Li	National University of Defense Technology – Academy of Military Medical Sciences	19	320	20
Kimmel, Roger	Spectral Energies, LLC – Wright Patterson Air Force Base	18	53	23

2.2.2 WoS Search Results

WoS provides access to research literature linked to a rigorously selected core of journals, ensuring a unique combination of discovery through captured metadata and citation connections. The WoS Core Collection provides over one billion cited reference connections indexed from high-quality, peer-reviewed journals, books, and proceedings from 1900 to present.

WoS was the final database used by DSIAC to search for top global researchers and organizations in hypersonics. The top researchers and organizations identified via the WoS

search are shown in Table 7. Using the term “hypersonic,” the WoS search was limited to conference articles and journals from 2016 to present.

Table 7: Top Researchers/Organizations in WoS

Researcher	Affiliation	No. of Documents	No. of Citations
Huang, Wei	National University of Defense Technology	27	242
Yan, Chongnian	Beihang University	25	81
Bu, Xiang-Wei	Air Force Engineering University, China	24	215
Bao, Wen	Harbin Institute of Technology	23	100
Liu, Jun	<ul style="list-style-type: none"> • Beihang University • Dalian University of Technology • Nanjing University of Aeronautics Astronautics 	22	89
Chang, Juntao	Harbin Institute of Technology	19	126
Yan, Li	National University of Defense Technology	19	193
Yu, Daren	Harbin Institute of Technology	18	125
Zhou, Jun	<ul style="list-style-type: none"> • Northwestern Polytechnical University • Air Force Engineering University, China 	18	30
Zong, Q	Tianjin University	17	61

2.3 SEARCH RESULTS ANALYSIS

There were two different metrics used to search top global researchers in hypersonics—the number of patents and the number of publications and citations. When comparing the searches, the following organizations appeared in the search results of each database:

- Beihang University, China.
- Northwestern Polytechnical University, China.
- Nanjing University of Aeronautics and Astronautics, China.
- National University of Defense Technology, China.

The following organizations appeared in the search results of at least two of the databases:

- China Aerodynamics Research and Development Center.
- Chinese Academy of Sciences.
- China Academy of Aerospace Aerodynamics.
- Harbin Institute of Technology, China.
- Air Force Engineering University, China.

Only one researcher, Jun Liu, appeared in all of our database search results. Affiliated with multiple organizations, he holds patents with the Academy of Military Sciences and authored publications with Nanjing University of Aeronautics and Astronautics and Dalian University of Technology, China. He has also coauthored multiple publications with Wei Huang of the National University of Defense Technology.

The following researchers appeared in the search results of at least two of the databases:

- Huang, Wei.
- Yan, Chongnian.
- Bu, Xiang-Wei.
- Yan, Li.
- Zhou, Jun.

Potential points of interest are as follows:

- Jun Liu and Li Yan were the coauthors on multiple publications with Wei Huang of the National University of Defense Technology.
- Three of the top 10 researchers were not affiliated with any of the top 10 organizations (Iain D. Boyd, Graham V. Candler, and Jun Liu).
- The Derwent search found that the following researchers identified in Table 5 hold multiple patents:
 - Wei Huang—4 patents.
 - Jun Liu—11 patents.
 - Li Yan—6 patents.

REFERENCES

[1] Elsevier. "Scopus. An Eye on Global Research: 5,000 Publishers. Over 71M Records and 23,700 Titles."