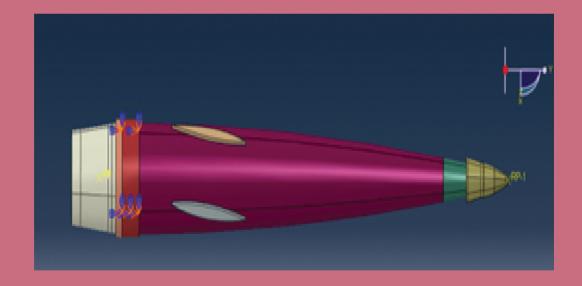
Volume 72, Issue 6, November 2022

ISSN:0011-748X

Defence Science

https://publications.drdo.gov.in/ojs/index.php/dsj







Published by Defence Research & Development Organisation

DEFENCE SCIENCE JOURNAL

A Publication of DRDO

Defence Science Journal is a peer reviewed, bi-monthly, multi-disciplinary defence research journal of the Defence Research & Development Organisation (DRDO), Ministry of Defence, Govt of India, published by the Defence Scientific Information & Documentation Centre, Delhi. It is brought out in the months of January, March, May, July, September, and November. The Journal publishes research papers, review papers, short communications, and research notes in various disciplines of science and technology.

Papers published in the Journal are covered/indexed by-Cambridge Scientific Abstracts, Chemical Abstracts, Embase, Compendex, Geobase, Embiology, Elsevier Biobase, Fluidex, World Textiles, Scopus, Indian Science Abstracts, International Aerospace Abstracts, Science Citation Index, Omnifile Full-text Mega, Omnifile Full-text Select, ProQuest, World News Connection, Google Scholar, DOAJ, Indian Citation Index. Online published papers are assigned with Digital Object Identifier (DOI).

Editorial Board

Dr Alexander N. Lukin

Western-Caucasus Research Centre, Russia

Dr Binay Kanti Dutta

Indian Institute of Technology Kharagpur, Kharagpur

Dr Clive Russell Woodley

Imperial College London, London, UK

Dr D.S. Ilcev

The Durban University of Technology, Durban, South Africa

Dr Debasis Chakraborty

Institute of Technology Bombay, Mumbai

Dr G. Madhusudhan Reddy

Defence Metallurgical Research Laboratory, Hyderabad

Dr G.S. Mukherjee

Defence Materials and Stores R&D Establishment, Kanpur

Dr Hari B. Hablani

Indian Institute of Technology Indore, Indore

Dr Indranil Manna

Birla Institute of Technology Mesra, Ranchi

Dr Joseph C (Joe) Majdalani

Auburn University, Auburn, Alabama, USA

Dr Kamla Prasan Ray

Defence Institute of Advanced Technology, Deemed University, Pune

Dr Kantesh Balani

Indian Institute of Technology Kanpur, Kanpur

Dr Luigi T. DeLuca

Politecnico di Milano, Milan, Italy

Dr Manish Rov

Defence Metallurgical Research Laboratory, Hyderabad

Dr N. Eswara Prasad

Defence Materials and Stores R&D Establishment, Kanpur

Dr Nil Ratan Bandyopadhyay

Indian Institute of Engineering Science and Technology Shibpur, Howrah

Dr P.A. Ramakrishna

 ${\it Indian\ Institute\ of\ Technology\ Madras,\ Chennai}$

Dr Soma Venugopal Rao

ACRHEM, University of Hyderabad, Hyderabad

Dr Sudarshan Kumar

Indian Institute of Technology Bombay, Mumbai

Dr Sudip Ray

The University of Auckland, New Zealand

Dr Suman K. Mishra

CSIR-National Metallurgical Laboratory, Jamshedpur

Dr Vikrant Bhateja

Shri Ramswaroop Memorial Group of Professional Colleges, Lucknow

Dr Yong Deng

Institute of Fundamental and Frontier Science, Sichuan, China

Editorial Team

Editor-in-Chief

Dr K. Nageswara Rao

Associate Editor-in-Chief

Smt Alka Bansal

Editor

Shri Yogesh Modi

Senior Assistant Editor

Shri Deepak Kumar Verma

Assistant Editors

Dr Faizul Nisha

Shri Tek Chand Chauhan

Editorial Assistant

Shri Biak Tangpua

Editorial Desk

Ph: 011-2390 2469/65/64 E-mail: dsj.desidoc@gov.in

Printing

Shri S.K. Gupta

For New Subscription, Renewals, Inquires, and Cheque Address

Shri Tapesh Sinha

DESIDOC, Metcalfe House, Delhi-110 054 Ph: 011-2390 2612; Fax: 011-2381 9151 E-mail: marketing.desidoc@gov.in

Annual Subscription

 Inland
 Foreign

 ₹ 1600.00
 US \$ 300.00

(Discount: 15 % to Publishers/Vendors and 30 % to Individuals) Subscription to be paid in advance by bank draft in the favour of **Director**, **DESIDOC**. Local subscribers may pay by cheque,

payable at Delhi.

Current and back issues are available at: https://publications.drdo.gov.in/ojs/index.php/dsj

The editor or publisher does not assume responsibility for the statements/opinions expressed by the authors of the papers.

© 2022, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi.

CODEN: DSJOAA ISSN: 0011-748X (Print) ISSN: 0976-464X (Online)

DEFENCE SCIENCE JOURNAL

VOLUME 72	NUMBER 6	NOVEMBER 2022
IN THIS ISS	UE	
Aeronautical	Systems	
771-782		Aircraft to Ground Alha Reddy and Nitin Sharma OOI: 10.14429/dsj.72.17713
783-792	Optimal Design of Hydraulic Disc Brake for Magnetorheological (MR) Ap	plication
	Danishtah Q	Puamar and Chiranjit Sarkar POI: 10.14429/dsj.72.18369
Armaments &	& Explosives	
793-800	Plastic Deformation of High Explosive Projectile 155 mm during Gun L Finite Element Method	aunch Conditions using
	Rajesh B. Ohol, B.A. Parate	and Dineshsingh G. Thakur
	Ε	OOI: 10.14429/dsj.72.18197
801-809	Experimental Study on the Thermodynamic Damage Power of Ammunition Explosive Device	Deflagration in a Closed
	Liangquan Wang,	Fei Shang and Deren Kong
	Σ	OOI: 10.14429/dsj.72.18323
Computers &	z Systems Studies	
810-823	Congestion Prediction in Internet of Things Network using Temporal Centralized Approach	Convolutional Network: A
	Vinesh Kumar Jain, Arka Prokash Mazumdar	and Mahesh Chandra Govil
		OOI: 10.14429/dsj.72.17447
824-835	Terrain Specific Real-Time Pixelated Camouflage Texture Generation and i	ts Impact Assessment
	Sachi Cho	oudhary and Rashmi Sharma
	Σ	OOI: 10.14429/dsj.72.17599
836-845	Solution of Large Sparse System of Linear Equations over GF(2) on a Mult	i-Node Multi-GPU Platform

An Algorithm for Exchanging Target-Asset Pairs using the Kidney Exchange Model

846-853

Eunjin Choi, Choonjoo Lee, Sungil Kim and Namsuk Cho

DOI: 10.14429/dsj.72.18414

Shruti Rawal and Indivar Gupta DOI: 10.14429/dsj.72.17656

Electronics & Communication Systems

Reliability Analysis of Radiation Tolerant Low Voltage CCCII Circuit for Space Applications

Aruna Pathak, Manoj Kumar Tiwari, Neeta Pandey,

Sajal K. Paul and Saiyid Mohammad Irshad Rizvi

DOI: 10.14429/dsj.72.17583

Wideband Fabric Antenna for Ultra Wideband Applications using for Medical Applications

S. Bhavani and T. Shanmuganantham

DOI: 10.14429/dsj.72.17919

Posign and Development of High Voltage High Pulse Power Supply using FPGA for Dynamic

Impedance Matching

Krishna Kumar Rai, A.V. Giridhar, D.R. Jahagirdhar and Ashish Rai

DOI: 10.14429/dsj.72.18165

Materials Science & Metallurgy

Addressing Thermal Distortion in Additive Manufacturing of Topology Optimized Structures Through

Reverse Shape Morphing

Akhilesh Jha, Gyanendra Pandey and Harpreet Singh Bedi

DOI: 10.14429/dsj.72.17977

893-901 Effect of Aviation Turbine Fuel Exposure on Interlaminar and In-plane Shear Properties of Glass Fiber

Reinforced Epoxy Composite

S.M. Shrivastava, G. Ramarao, M.K. Buragohain and N. Selvaraj

DOI: 10.14429/dsj.72.18238

Annual Index

902-906 Index to Defence Science Journal, Volume 72, 2022

Reviewers List

907-908 Reviewers List of Defence Science Journal 2022

Back Cover: Information for Contributors

(ii) Book/Monograph

Hitchins, Derek K. System engineering: A 21st century systems methodology. John Wiley, London, 2007. 502p.

DeMers, M.N. Fundamentals of geographic information systems. Ed. 3. John Wiley, New York, 2005.

(iii) Chapter from a Book

Bodony, D.J. & Lele, S.K. Applications and results for large-eddy simulations for acoustics: Far-field jet acoustics. *In* LES for eddy acoustics, edited by C. Wagner, T. Huttl & P. Sagaut. Cambridge University Press, Cambridge, UK, 2005. pp. 289-310. doi: 10.1017/CBO9780511546143.008

Lokesha, B.N. Advanced avionics and electronic warfare system for fighter aircraft. *In* DRDO Technology Spectrum. Defence Research and Development Organisation, New Delhi, 2008. pp. 10-26.

(iv) Conference Paper

Puszynski, J.A. Recent advances and initiatives in the field of nanotechnology. Paper presented at 31st International Pyrotechnic Seminar, Fort Collins, Colorado, USA, July 2004. pp. 233-40.

Ekstein, J.; Freitag, E.; Hirsch, C. & Sattelmayer, T. Experimental study on the role of entropy diffusion waves in low-frequency oscillations for a diffusion burner. *In* Proceedings of the ASME Turbo Expo 2004: Power for Land, Sea, and Air. edited by R.S. Harris. ASME, Fairfield, NJ, 2004. doi:10.1115/GT2004-54163

(v) Report

Savage, S.J. Defence applications of nanocomposite materials. FOI-Swedesh Defence Research Agency, User Report No. FOI-R-1524-SE. December 2004.

(vi) Patent

Man, T.Y.; Leung, C.Y.; Leung, K.N.; Mok, P.K.T. & Chan, M. Single-transister-control low-dropout regulator. US Patent No. 7285952, 23 October 2007.

(vii) Standard

International Organisation for Standardisation. Document Management–Electronic document file format for long-term preservation–Part1: Use of PDF 1.4 (PDF/A-I). ISO 19005-1:2005, ISO, Geneva, Switzerland, 2005.

(viii) Thesis/Dissertation

De Roek, W. Hybrid methodologies for the computational aeroacoustic analysis of confined, subsonic flows. Katholieke University, Leuven, Belgium, 2007. PhD Thesis.

(ix) Personal Communication

Personal communications shall not be listed under references but included in the text itself. The references shall be given as shown below:

The number of registered publications under Copyright Clearance Centre (CCC), Salem, USA, now totals approx. 6000,000 titles used by 3,600 publishers (personal communication with CCC), whereas in 1986 there were only 58,000 publications registered from 1,100 publishers.

Apart from the above guidelines, the form in which the cited document is published, for example, microfiche, CD-ROM or other electronic medium; and the language of publication if other than English should be indicated in parentheses at the end of the reference. If the cited document is unpublished, it should be indicated in parentheses at the end of the reference as 'in press' with DOI No.

(g) Tables

Tables should supplement and not duplicate the information contained in the text. They should be explicitly referred to in the text in numerical order with brief titles. Column headings should be brief, bold and the units of measurement should be placed below the headings in parentheses.

Maximum Five (5) Tables are allowed in a manuscript.

(h) Illustrations

All figures (charts, diagrams, line drawings, and photographic images) should be of good quality and submitted both electronic and hard copy originals. Illustrations should be numbered in order of their occurrences in the text with Indo-Arabic numerals and with short descriptive captions. Lettering should be in capital only and remain legible after a reduction of 50-60 per cent. Scanned/photocopied images reproduced poorly should be avoided. Illustrations taken from other publications must be acknowledged. It is the author's responsibility to obtain permission for reprinting such illustrations in *Defence Science Journal*. The preferred format is encapsulated postscript (.eps) for line figures and .tif for halftone figures with minimum resolution of 300 dpi (dots per inch). Colour should be used only where absolutely necessary for understanding of the figure. Colour should not be used for distinguishing data in line diagrams.

Maximum Six (6) figures are allowed in a manuscript.

(i) Symbols/Units

Non-standard abbreviations should be shown in brackets when first mentioned, and should be used whenever the same terms appear again in the text and not in the title and abstract. Usage of metric units is preferred.

(j) Nomenclature

The nomenclature of mathematical symbols and signs used in the text should be given immediately after the keywords. Authors can follow any of the standard units and symbols developed by international agencies in their fields for this purpose.

(k) Special Items

When chemical/mathematical equations are used in papers, these should be legible. The symbols, not covered in nomenclature (or when nomenclature is not given), should be explained immediately after their first usage in the text. Equations should be consecutively numbered in whole numbers in parentheses (for example, (2), (15), (19), etc.) at the right margin. Reference to the equations in the text should be abbreviated as Eqn (1), Eqns (5-7), etc. Complex structural formulae of chemical compounds should be prepared as illustrations. Capital, lower case and Greek letters should be distinguished clearly. Letters which are sometimes confused for one another (for example, O & 0; 1 & 1; V, v & n; r & p; X, x & c; K, k & k; E & e; etc.) should be clearly distinguished. A Greek letter should be spelt out in margin where it is first used.

(l) Proofs and Complimentary Journal

The final proof of the paper will be sent for correction in three working days to the author for clearance before printing. All the author(s) will be supplied with a softcopy of issue, free of charge. Author will receive one printed copy of the issue as complimentary.

INSTRUCTIONS FOR CONTRIBUTORS

Objective

Defence Science Journal, a bi-monthly Journal of the Defence Research & Development Organisation (DRDO), publishes original research papers having a direct bearing on Military/Defence applications. It covers natural science, technology, and engineering.

(a) Typescript Requirements

Research papers (max length: 3000 words or 10 typed pages of A4 size including figures) containing original research findings in a clear and concise manner. Papers reporting theoretical, laboratory and field test results are also accepted.

Review articles (max length: 5000 words or 20 typed pages of A4 size including figures) are expected to cover survey, integrate, and critically examine new information accumulated in recent years in a particular subject field. Review articles from subject experts are also commissioned by the Editor.

Short communications/research notes/scientific correspondence (Max length: 2000 words or 8 typed pages including figures) are normally brief reports or technical notes on the progress of ongoing research and/or an application.

(b) Refereeing Process

Papers received for publication are to be peer reviewed by a panel or research experts.

(c) Submission of Typescripts

Typescript should be neatly typed in single space on one side of the A4 size (210 mm x 297 mm) paper, with a margin not less than 40 mm on the left side. It should include: (i) title page with a running (short) title, (ii) abstract, (iii) keywords, (iv) nomenclature of symbols used, (v) tables/figures/illustrations typed/drawn on separate sheets along with their captions in serial order as these appear in text, and (vi) a separate list of figure captions. The reporting in the paper should be in third person.

Manuscripts should be submitted online at: https://publications. drdo.gov.in/ojs/index.php/dsj in MS Word format. In case of problems in uploading, a copy can be sent at dsj.desidoc@gov.in

Authors may furnish the following certificate at the time of submission of manuscript along with covering letter.

[This is to certify that the reported work in the paper entitled "......." submitted for publication in the Defence Science Journal is an original one and has not been submitted for publication elsewhere. I/we certify that citations to the previously reported works have been given and no data/tables/figures have been quoted verbatim from the other publications without giving due acknowledgement and without permission of the author(s). The consent of all the authors of this paper has been obtained before submitting.

[Signatures and names of all the authors]

(d) Title Page

The title page should include: title of the article, name(s) of author(s) and affiliation(s); complete address (including telephone/fax numbers, e-mail address) of the author (in case of a single author paper) or the contact person (in the case of a Co-authored paper) to whom communications should be sent. It should also include a short title not more than 50 characters to be used as running title. The titles should be brief, clear and provide a broad introduction of the paper.

(e) Abstract and Keywords

An abstract of about 200 words for research papers, 150 words for review articles, and about 100 words for research notes and short communications should be provided. Appropriate keywords should be given where necessary.

(f) References and Footnotes

References to already published literature should be numbered consecutively in order of their citation in the text and placed at the end of the text. In the text these should be indicated by superscripts (number placed above the line) (1). References to personal communication should not be placed under references, but cited in the text in the parentheses. A reference should be listed only once. Use of *ibid.*, *idem.*, *op.cit.*, should be avoided. An already cited reference when repeated, should be given in parentheses (for example, ref. 5, p. 79; ref. 15, p. 193; etc). Explanatory material may be given as an Appendix.

Defence Science Journal Style uses a notational method of referencing when referring to a source of information within the text of a document. In its simplest form, a citation is given in the text, consisting of a number in superscript. Examples of citations in different types of documents are given below:

(i) Journal Article

Laxminarayana, Karthik & Jalili, Nadar. Functional nanotube-based textiles: Pathway to next generation fabrics with enhanced sensing capabilities. *Text. Res. J.*, 2005, **75**(9), 670-81. doi: 10.1177/0040517505059330

Weifan, C.; Fengsheng, L.; Jianxun, L.; Song, Hongchang & Yu, Jiyi. Nanometer Co_3O_4 powder by solid phase reaction. *Cuitua Xucbao*, 2005, **26**(2), 1073-77 (Chinese).

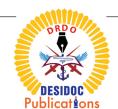
Standard abbreviations as per the International Serials Catalogue of the International Council of Scientific Unions-Abstracting Board (ICSU-AB) should be used for the titles of journals. However, single and double worded journal titles (for example, *Nature, Science, Scientific American*) should be given in full.

Electronic sources should include the URL and date of access

Wang, Z.J.; Birch, J.M. & Dickinson, M.H. Unsteady forces and flows in low Reynolds number hovering flight: Two-dimensional computations vs robotic wing experiment. *J. Experi. Biol.*, 2004, **207**(3), 449-60. doi: 10.1242/jeb.00739 http://jeb.biologists.org/cgi/content/full/207/3/449 [Accessed on 17 November 2007].

(Contd on inner cover)





Cover: Boundary conditions: Rotational and translational motions restrained at driving band., pp. 793-800.