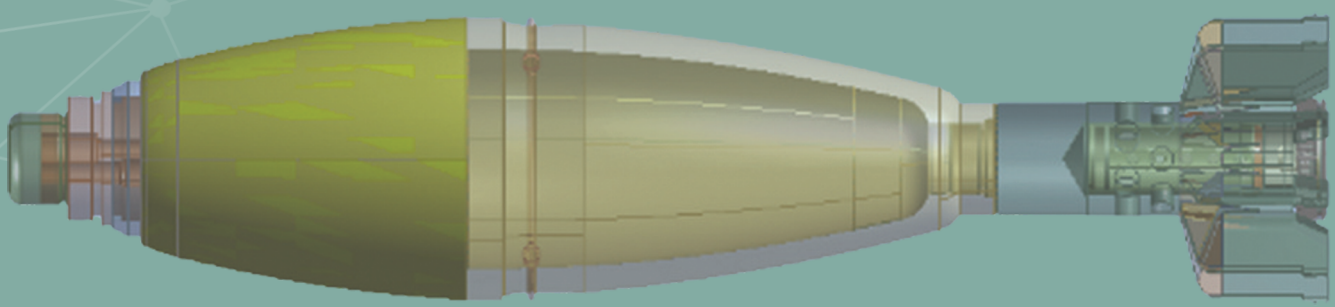
ISSN :0011-748X

Volume 74, Issue 6, November 2024

Defence Science Journal

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



DRDO

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, Indian Citation Index. Online published papers are assigned with Digital Object Identifier (DOI).

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

Printing
Mr. Rajesh Kumar Singh

For New Subscription, Renewals, Inquires, and Cheque Address
Ms. Dipti Arora
DESIDOC, Metcalfe House, Delhi-110 054
Ph: 011-2390 2612 ; Fax: 011-2381 9151
E-mail: marketing.desidoc@gov.in

Annual Subscription

₹ 3000.00 (INR)

(*Discount: 15 % to Publishers, Vendors and 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**

CODEN: DSJOAA

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

DEFENCE SCIENCE JOURNAL

VOLUME 74 **NUMBER 6** **NOVEMBER 2024**

IN THIS ISSUE

Aeronautical System

777-786 Effect of Variation of Damping Gap on Damping and Unbalance Response of a Compact Squeeze Film Damper: Experiments and Simulations

Anurag Kumar, Aman K. Srivastava, Mayank Tiwari and *Akhilendra Singh*

DOI : 10.14429/dsj.74.19119

787-794 Numerical Evaluation on Performance Analysis of Settling Chamber in Tri-Sonic Wind Tunnel

K. Balaji, H. Sathish, G. Balu, V. Shanmugam, Prakash Singh, V. Gautham, C. Vasantharaj and *P.S. Prem Kumar*

DOI : 10.14429/dsj.74.19382

795-803 A Baseline Nonlinear Flight Controller Design Approach For A Fighter Aircraft With A Shorter Design Cycle Time

P. Lathasree, Abhay A. Pashilkar and *N. Sundararajan*

DOI : 10.14429/dsj.74.19488

804-811 Effect of Torrential Rainfall on Aerodynamic Characteristics of MALE UAV With Two-Element Airfoil Wing Using CFD Approach

M. Vijayakumar, K.M. Parammasivam and *S. Rajagopal*

DOI : 10.14429/dsj.74.19904

Armaments & Explosives

812-821 Performance Evaluation of Gun Damping Systems with Variable Recoil Length and Spring-Loaded Valves

Mohamed Abdullah, Wael Elsaady, Ahmed Ibrahim and *Ibrahim Elsherif*

DOI : 10.14429/dsj.74.19406

822-833 Design of Shaped Charges With Optimum Armored Penetration Efficiency

Kerem Can Albayrak, Murat Üçüncü and *Faruk Elaldi*

DOI : 10.14429/dsj.74.19485

Combat Engineering

834-847 Evaluation of the Turbulence Model Effects on the Flow Field and Sound Pressure Levels Generated by Small Caliber Weapons System

Seyda Ozbektas, Bilal Sungur and *Onur Gurdamar*

DOI : 10.14429/dsj.74.19469

848-856 Predicting the Dynamics and Trajectory of a Projectile Using a Six Degrees of Freedom Model

Sourabh Khambra, Bittagopal Mondal and *Dipankar Chatterjee*

DOI : 10.14429/dsj.74.19853

857-866 Adhesion Characteristics of External Protective Coatings for Combat Vehicle Bodyworks

Piotr Rybak, Zdzisław Hryciów, Bogusław Michałowski, Andrzej Wiśniewski and *Michał Wojciechowski*

DOI : 10.14429/dsj.74.19943

867-877 Comparison of the Ballistic Performance of Kevlar and UHMWPE Helmets Using FEM
I.F. Saruhan and *R. Gunes*
DOI : 10.14429/dsj.74.20001

Computers & System Studies

878-884 Accelerating Deep Network Training for Radar Identification Using Batch Normalisation
Preeti Gupta, Pooja Jain and *O.G. Kakde*
DOI : 10.14429/dsj.74.19475

885-892 Hybrid-Neuro Bandit: A Bandit Model for Online Recommendation
Nipun Bansal, Manju Bala and *Kapil Sharma*
DOI : 10.14429/dsj.74.19846

893-903 Fuzzy Soft Set-Based Identification of Best Chaotic System for Security Applications
Meenakshi Agarwal, Arvind, Chaman Arya and *Ram Ratan*
DOI : 10.14429/dsj.74.19877

Electronics & Communication Systems

904-910 A Wideband Dual Polarised Hat Feed-based Ku-Band Reflector Antenna for Man Portable Satcom Application
Rajesh Roy, Raj Kumar and *V.K. Singh*
DOI : 10.14429/dsj.74.19270

911-920 Multiple Jammer Attacks on Cognitive Radio Networks over Noisy Channels: A Strategic Game with Incomplete Information
Deepak B.R. and *Dhananjay Kumar*
DOI : 10.14429/dsj.74.19808

921-928 Development of Plenoptic Camera as Wavefront Sensor
Snehal Tonpe, J. Sreekantha Reddy, Chayan Bhar, Amit Pratap and *Jagannath Nayak*
DOI : 10.14429/dsj.74.19923

Materials Science & Metallurgy

929-936 Comparison of Different Additively Manufactured Ti6Al4V Scaffold Designs
Sachin Singh, J.S. Saini and *Rojdeep Singh*
DOI : 10.14429/dsj.74.19759

937-941 Optimising Parameters for Dry EDM Machining of Inconel 800 Through OFAT Approach
Prashant Tripathi and *Shankar Singh*
DOI : 10.14429/dsj.74.19824

Missile Systems

942-949 Design, Fabrication and Testing of a Hybrid Rocket Engine Prototype
Dilara Koçak, Türker Erdem Öksüz, Mertcan Koçak, Utku Şentürk, Necdet Özbalta and *Aydoğan Özdamar*
DOI : 10.14429/dsj.74.19363

Naval Systems

950-957 Performance Prediction of Composite Marine Propeller Under The Influence of Hull Wake
Ashok Kumar and *R. Vijayakumar*
DOI : 10.19512/dsj.74.19865

Annual Index

958-962 Annual Index to Def. Sci. J., Vol 74, 2024
963-964 Reviewers List of Def. Sci. J. - 2024
Back Cover: *Information for Contributors*

(*Contd from the outer cover*)

(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; l & 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.

Printed and published by the Defence Scientific Information and Documentation Centre, Metcalfe House, Delhi-110 054.

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 submited 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: 848-856.

DESIDOC Publications