Association for Machines and Mechanisms News Bulletin

Volume 9, No. 2 April 2017

Message from the Editor-in-Chief

After delayed publication of the January 2017 issue of the Bulletin of the Association for Machines and Mechanisms (AMM), we are on time to publish the April 2017 issue well within the month of April.

With the active support of Dr. R. Ranganath of Spacecraft Mechanisms Group, ISRO Satellite Centre, Bangalore, Bulletin of the AMM Volume 9, No. 2, April 2017 issue is now ready for publication. Dr. Ranganath, as Zonal Vice President (South), co-edited this issue. He collected an article from Spacecraft Mechanisms Group, ISRO Satellite Centre, Bangalore to include in this issue.

The interesting article from Spacecraft Mechanisms Group, ISRO Satellite centre is on "Deployment Mechanisms for ASTROSAT - The First Indian Space Astronomy Observatory" contributed by S Narendra and K Balaji. We all know ISRO is doing wonders in the space sector to hold the pride of India high. The development of typical mechanisms in space sector as outlined in this article is sure to draw keen interest among the readers.

Brochures of different events that are being organized across the globe are placed in this bulletin as usual. Special mention is to make regarding organization of iNaCoMM-2017 by Bhaba Atomic Research Centre during December 13-15 2017 in Mumbai. This is the 3rd International and 18th National Conference on Machines and Mechanisms. There will also be a Student Mechanism Design Contest.

Dr. G. Saravana Kumar, Secretary AMM, and other office bearers of the AMM deserve special thank for extending background support as usual.

AMM members and other interested persons are requested to contribute articles and send the same to the editorial team for July 2017 issue. Constructive suggestions, comments for improvement of the Bulletin of the AMM are requested.

On behalf of the Editorial Team of the Bulletin of AMM, I thank all concerned for their support, good wishes and suggestions for bringing out of this Bulletin.

Hope for the best Season's Greetings !

Prof. Santanu Das
Editor-in-Chief

Our Objectives and Activities

The main objective of AMM is to contribute to mechanical design at all levels starting from academic research to industrial initiatives, thereby enhancing the quality and reliability of indigenous machines. With this in view, AMM organises the International & National Conference on Machines and Mechanisms, iNaCoMM, and the workshops on Industrial Problems on Machines and Mechanisms, IPRoMM regularly.

Inside This Issue

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About the Association of Machines and Mechanisms (AMM)

AMM headquarters are currently located at the Department of Engineering Design, IIT Madras. A new set of office bearers have taken charge of the affairs of AMM. AMM invites both individual and corporate membership from Indian academia, research organizations and industry. Membership benefits and other information about AMM are available at www.ammindia.org. The body of Zonal Vice Presidents (ZVPs) is active over the past several years with representations from the four corners of the country. They are playing the role of nodal agencies so as to decentralise the AMM official activities and to organise workshops under the aegis of AMM to popularise the mechanism science in their respective regions. They also form the editorial team of this news bulletin. AMM invites contributory articles from its members and others working in the various fields of mechanisms science for this quarterly news bulletin. Interested people can contact the editorial team.

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There is only one way to avoid criticism: do nothing, say nothing, and be nothing.

--- Aristotle

Deployment Mechanisms for ASTROSAT - The First Indian Space Astronomy Observatory

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1. INTRODUCTION

ASTROSAT, spacecraft which is India's first space based observatory for astronomy was launched successfully from the Indian spaceport at Sriharikota on September 2015. The spacecraft has been placed in a 650 km, 6 degree inclined circular orbit using the PSLV-C30 launch vehicle. The main mission objective of the spacecraft being to provide a space based multi-wavelength astronomical observatory.

The spacecraft carries a set of five payloads which are sensitive over a wide spectrum of wavelengths covering visible, ultraviolet, soft x-rays and hard x-ray bands. The five payloads flown on ASTROSAT are, two Ultra Violet Imaging Telescopes (UVIT), a Soft X-ray Imaging Telescope (SXT), a Sky scanning Monitor (SSM), three Large Area Xenon filled Proportional Counters (LAXPC) and a Cadmium Zinc Telluride array (CZT).

The deployment mechanisms constitute, two deployable covers for the UV Imaging Telescope, a deployable cover for SX Imaging Telescope, a Hold down Release and Steering Mechanism for SSM and two numbers of Solar Array Deployment Mechanisms (SADM), The Figure 1 shows the spacecraft configuration with the mechanisms in the stowed and deployed configurations.

All the mechanisms have deployed successfully in-orbit and have performed flawlessly. The paper presents a brief insight into the design requirements, challenges for ASTROSAT mechanisms, providing the salient mechanism specifications and their performance in-orbit.

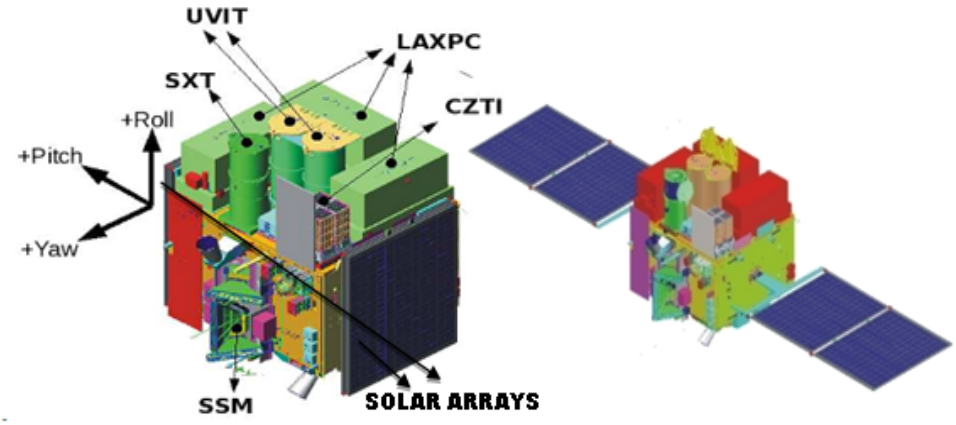


Figure 1: ASTROSAT spacecraft in stowed and deployed condition

2. THE CHALLENGES FOR ASTROSAT MECHANISMS

The major challenges to the design and qualification of mechanisms specific for ASTROSAT mission were:

a. Stringent Contamination control requirements

ASTROSAT mission carrying the optical payloads in the UV and soft X-ray range posed severe constraints with regards to the contamination aspects both molecular and particulate contamination both during the ground test phase and in-orbit conditions. The UV payloads were especially critical of the molecular contaminants and required all the elements on the spacecraft to adhere to the stringent cleanliness procedures. The material selection particularly the polymers had to be carefully selected as it called for a Total Mass Loss (TML) of < 1% and Collectable Volatile Condensable Matter (CVCM) of <0.01% . Also the usage of wet lubricants was limited and dry lubrication of MOS_2 was the preferred choice. A new material called **Techtron HPV** was considered for the usage in mechanisms and the material was extensively tested and qualified for use on the telescope cover mechanisms.

b. Low source shock release mechanisms

The hold down and release mechanisms near the telescope optics had to be of low source shock. To cater to this requirement the conventional pyro-cutter mechanisms could not be used and an alternative using the Paraffin actuator was considered which provided for a low source shock and could be used near the optics.

c. Higher vibration loads.

The telescope cover mechanisms were located at the tip of the long telescope baffles. This location of the covers at the end of the long baffles provided for higher vibration loads due to the cantilever action of the baffles and hence the covers had to be designed and qualified for higher vibration loads (100 g in the longitudinal axis and 80 g in the lateral axis).

d. **Deployments after long storage in space environment**.

The telescope aperture covers were required to be deployed only after a long duration of storage (~ 60 days) in stowed condition in orbit. This was called for to ensure that the initial out-gassing of the spacecraft in the orbit subsides and the telescope covers can be deployed to expose the optics inside safely without getting contaminated.

All the above constraints were considered in the design , assembly and test phases of the mechanisms and the hardware realized by following proper material selection, strict contamination control procedures, extensive testing for both vibration and thermo-vac conditions.

3. SALIENT ASTROSAT MECHANISM ASPECTS

The salient aspects of the mechanisms in ASTROSAT are as provided below.

a. UV-Telescope Cover Mechanisms

There are two UV telescopes in ASTROSAT, which are mounted centrally in the spacecraft as shown in the Figure 2. These telescopes cater to the Far UV (FUV) band of 130- 180nm, Near UV (NUV) band of 200 to 300 nm and the visible band of 320 – 550 nm.

The UV telescope optics have a stringent contamination control and thus two deployable covers are provided at the top baffle of the telescope, which protect the telescope optics from contaminants during the ground phase and initial 64 days of in-orbit phase of the spacecraft. The telescope covers also function as sunshades on deployment and prevent the sun rays from

entering into the optics. The cover mechanisms consist of two spring driven hinges and a paraffin actuator based Hold Down and Release Mechanism (HDRM) as shown in the Figure 2. The cover is held in the stowed condition by means of the Hold down mechanism with a preload of 100kgf. The two hinges provide for the energy of deployment and also provide for the centre of rotation for the cover and help in latching the cover in the final deployed position.

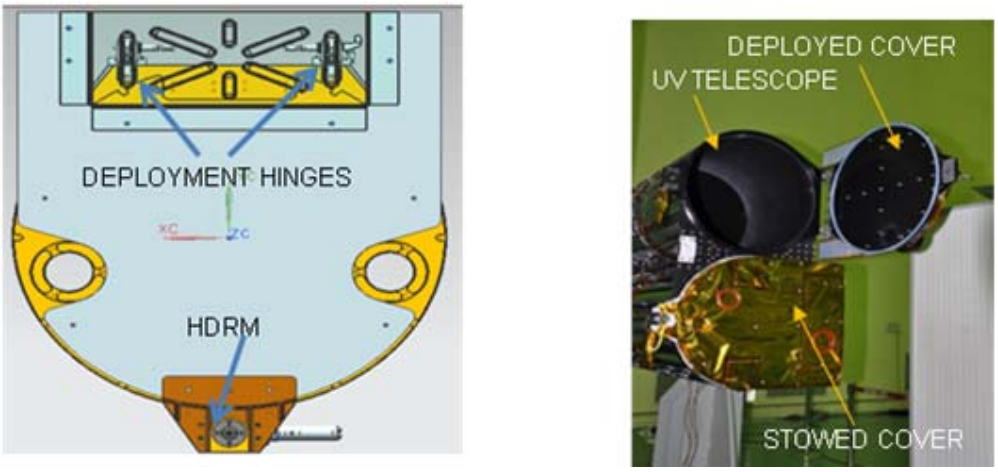


Figure 2: UV telescope cover model & cover deployment in Lab

b. Soft X-ray Imaging Telescope (SXT) Cover Mechanism

The Soft X-ray Imaging Telescope consists of X-ray reflecting mirrors and an X-ray CCD for imaging and spectral studies in the 0.1 – 8 keV. The SXT cover mechanism is similar to the UV cover mechanisms, except for the fact that the diameter of the cover is smaller and the angle of opening of the cover is different. The HDRM is identical to the UV mechanisms. The hinges are suitably designed to obtain the required angle of opening of 256 degrees as shown in Figure 3. Unlike in UV telescopes the covers on deployment do not act as sun shades.

Both the telescope covers for UV and SX Telescopes are made up of a thin section of Al-6061 material and have a honeycomb deck stiffener bonded on the outside of the cover to provide for the stiffness of the cover. The cover mechanisms were new developments and the paraffin actuator based hold down release mechanism was also developed in-house to provide for a low source shock release mechanism. The deployment of these mechanisms are mission critical and hence the cover mechanisms were extensively tested on ground and qualified for the launch vibration loads and the in-orbit thermal and vacuum environmental conditions.

All the cover deployments in orbit were as predicted and all the telemetry indications are nominal. The Table 1 provides the salient specifications for the SXT cover mechanisms

Table 1: Salient Cover Mechanism specifications

Specification	UVIT	SXT
Number of Hold downs	One	One
Number of Hinges	Two	Two
Angle of opening	95 degrees	256 degrees
Cover Diameter	424 mm	377 mm
Hold down release actuator	Paraffin Actuator	
Mass (for 1 cover)	2.4 Kg	1.4 Kg

Figure 3: SXT Cover Deployed condition

c. SSM Hold Down Release & Steering Mechanism

The Scanning Sky Monitor (SSM) consists of three proportional counters, with coded masks which are mounted on a platform (Figure 4). The payload is mounted on the anti sun side of the spacecraft as shown in the Figure 1.

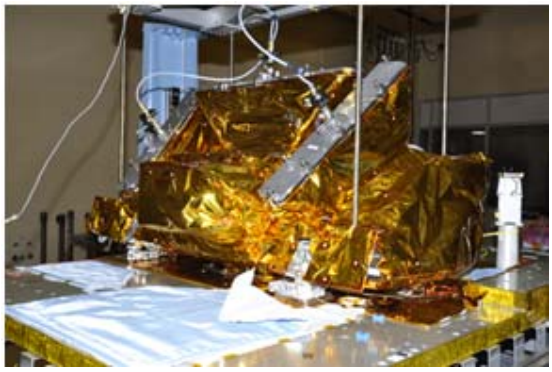
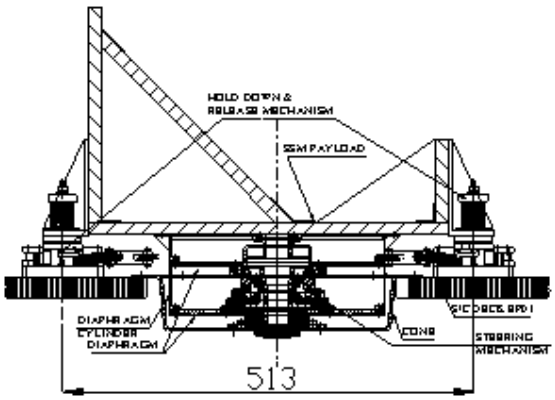



Figure 4: SSM Payload on s/c Deck with Steering and HDR Mechanism

The complete platform should be capable of being rotated by ±175 degrees, continuously. Also during the launch the platform is to be held on to the spacecraft deck so as to provide the requisite launch frequency and withstand the launch loads. The mechanisms consist of two main assemblies namely

- The Hold Down and Release Assembly
- The SSM Steering Mechanism Assembly

The Hold Down & Release Mechanism(HDRM):

The SSM platform is held down at four hold down locations to withstand the launch loads and is released in orbit to allow for the steering operation of the payload. The hold down and release mechanism is as shown in the Figure 5.

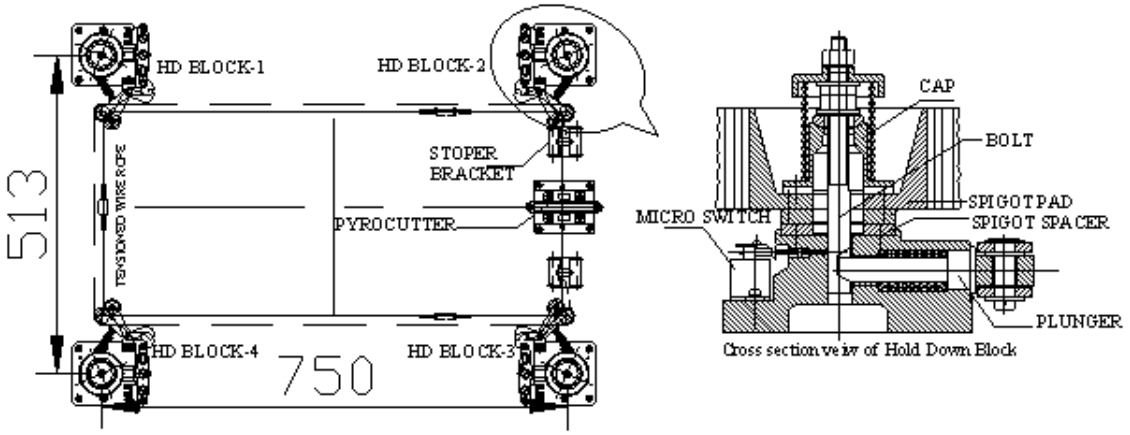


Figure 5: SSM Hold Down and Release Mechanism

At these hold down locations the platform is held on to the deck by means of preloaded bolts. All the hold down bases are connected by a continuous hold down release loop which helps in retaining the preloaded bolt in position in the hold down bases. The hold down release loop is cut by means of a pyrocutter, which in turn releases all the hold down bolts simultaneously. The salient specifications of the HDRM are as given in the Table 2.

Table 2: Salient SSM HDRM & Steering mechanism Specifications

SSM HDRM Specifications	
Specification	**Value**
Number of Hold downs	Four
Hold down spacing	750 x 513 mm
Release Actuator	Pyro cutter
Hold down Preload	800 Kgf
Wire rope tension	100 Kgf
Mass of HDRM	3.3 Kgs

SSM Steering mechanism Specifications	
Specification	**Value**
Motor Drive Type	Stepper Motor
Gear Drive	Harmonic Gear Gear ratio 157: 1
Angle Encoder	resolver
Positional Accuracy	1 arc minute
Angular movement	±175 deg.
Mass of steering	6.0 Kg.

SSM Steering Mechanism:

The SSM steering mechanism consists of a stepper motor drive in conjunction with a harmonic gear drive. The motor is fixed to the housing which is connected to the payload platform through a pair of diaphragms as shown in Figure 4 & 6. The angle of rotation is primarily obtained by means of the resolver.

On release of the hold down mechanism the platform pops up by 3mm due to the release of strain energy of the diaphragms. The diaphragms also provide necessary deployed stiffness to the platform. The mechanism can be commanded to perform in the continuous open loop movement, step stare and parking modes of operation. The salient specifications of the steering mechanism are provided in Table 2.

The SSM hold down release was initiated immediately after the solar array deployment confirmation and the release operation was nominal and all the telemetry indications obtained for the release condition confirmation. Subsequently the steering operations of the mechanism were performed and all the modes of operation were checked and found to be

performing nominally. The payload steering operations are being carried out on a regular basis and are found to be satisfactory.

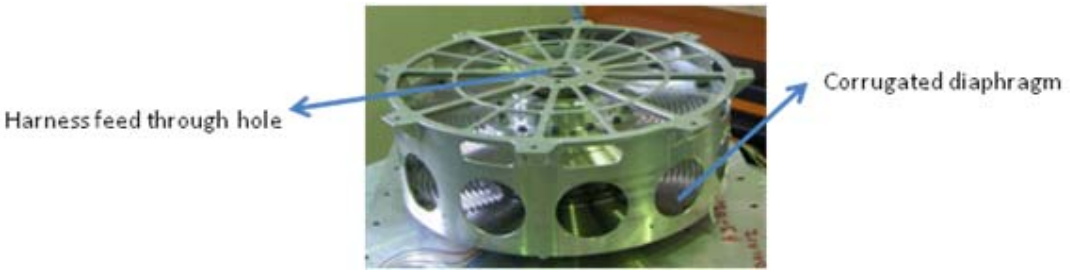
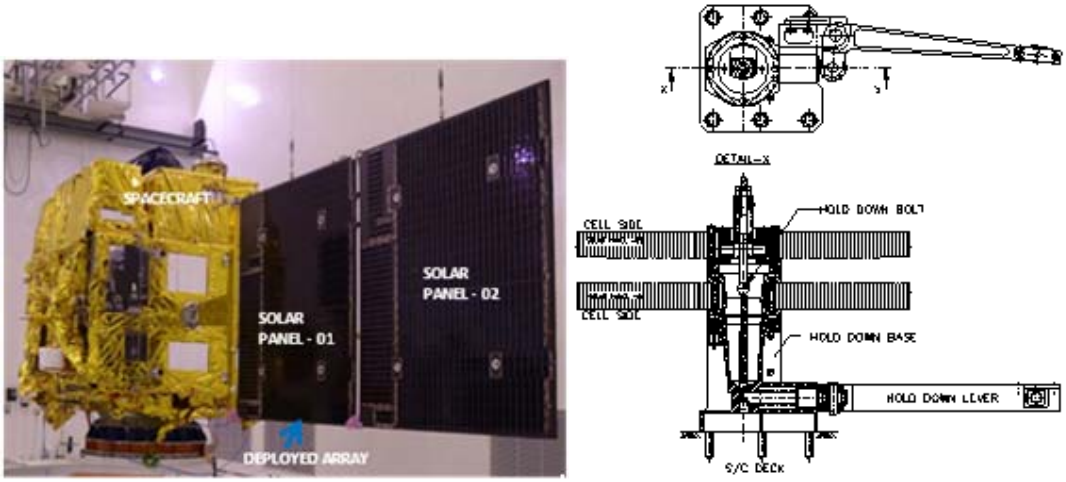


Figure 6: SSM Steering Mechanism

d. Solar Array Deployment Mechanisms



(a) (b)

Figure 7a & 7b: Deployed Solar Array during ground tests and Hold down assembly

The on-board power requirements of the spacecraft are met by means of the power generated using the solar energy. For this purpose the spacecraft consists of two deployable solar arrays consisting of two solar panels in each array (as shown in the figure 7a). The solar panels are populated with improved triple junction solar cells capable of generating around 1600 watts of power. The solar arrays are stowed on the two opposite decks of the spacecraft.

The Solar Array Deployment Mechanisms (SADM) provides for the stowing of the solar arrays on to the spacecraft deck in the launch configuration by means of four hold downs and a pyro-cutter based Hold down Release loop. The Figure 7b shows the typical two panel hold down assembly. The deployment hinges provide for the deployment energy required for the array deployment and also provide for the latching of the array in the end position. The deployment of the array on being injected into the orbit is by means of a SNAP related auto program sequence in-built into the spacecraft, which commands the pyro-cutter, releasing the hold downs and deploying the array. Both the solar arrays deployed successfully in orbit and the functional parameters were normal.

Table 3: Salient SADM specifications

Specification	Value
Number of Hold downs	Four
Panel Deployment	Near accordion type of deployment by using CCLs.
Hold down release actuator	Pyro-cutter
Mass of SADM for 1 array	8.0 Kg

4. CONCLUSIONS

This article provides the reader a brief insight into the various deployment mechanisms developed for ASTROSAT mission. The challenges posed for the design of the deployment mechanisms have been indicated and a brief of the configuration of the mechanisms, their functions and the salient specifications have been provided.

REFERENCE

1. S. Narendra, K. Balaji, G. Nagesh, et al., Development of Mechanisms for ASTROSAT, Proceedings of ARMS- 2005 Conference, 2005.
2. K. Balaji, S. Narendra, G. Nagesh, C.D. Sridhara, Enhancement of deployable cover stiffness- a case study of analysis and results, Proceedings of ARMS- 2012 Conference, 2012.
3. K. Balaji, K. Karthikeyan, et al., Payload Platform Harness Rotation Mechanism, Proceedings of ARMS- 2015 Conference, 2015.
4. K. Balaji, S. Narendra, K.A. Keshavamurthy, Frequency analysis & test results of space telescope covers, Proceedings of ARMS- 2016 Conference, 2016.
5. ISRO, Other ASTROSAT Project Documents, ISRO internal report.
6. ISRO, Mechanisms on-orbit performance document, ISRO internal report.

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Authors are invited to submit a full paper of max. 8 pages through the submission system at the symposium website. The official languages of the Symposium are English, Azerbaijani and Russian. Each paper will be reviewed by the members of the Scientific Committee. All accepted articles will be published in the scientific journal Machine Science (ISSN 2227 – 6912), and also in scientific proceeding of the Symposium with ISBN, and also with the modified version the selected papers will be published in scientific journals of IFToMM.

Deadlines

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Acceptance of notification – 30.04.2017
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Keshava Murthy K A	ISRO Satellite Centre ,Bengaluru
Marco Ceccarelli	University of Cassino, Italy, President, IFToMM
Pushparaj Pathak	IIT, Roorkee
Ranjan Mukherjee	Michigan State University
S. Bandyopadhyay	IIT Madras
S. Satish Kumar	CMTI, Bengaluru
Sanjay Burman	Director, CAIR, Bengaluru
Sankar Nath Shome	CMERI, Durgapur
Subir Kumar Saha	IIT Delhi
Sudipto Mukherjee	IIT Delhi
Sunil K. Agrawal	Columbia University, New York
Y. Nakamura	University of Tokyo

STUDENT MECHANISM DESIGN CONTEST

One of the key objectives of the Association for Machines and Mechanisms (AMM) is to promote innovation among the students. A mechanism design contest has been made as an integral part of iNaCoMM, since 2009. The purpose of the competition is to encourage the students to apply their theoretical knowledge in the domain of mechanisms and machines to solve problems relevant to the society.

Details available in the conference web portal: www.inacomm2017.org

REGISTRATION FEE

	Delegates from	India (INR)	Others (USD)
1.	Students & Full time Research Scholars	1500	100
2.	Academic & Research Organizations	3500	250
3.	AMM or IFToMM Members	3000	200
4.	Others	5000	300

IMPORTANT DATES

Authors are invited to submit a two-page extended abstract as per the schedule given below and the guidelines available in the conference website.

Submission of Abstract	May 15th, 2017
Acceptance of Abstract	May 31st, 2017
Submission of Full Paper	July 15th, 2017
Notification of provisional decision & Reviewer comments	Oct. 2nd, 2017
Final submission of Camera-Ready Paper after addressing reviewer comments	Nov. 15th, 2017
Registration	Nov. 15th, 2017

VENUE

DAE Convention Centre
Anushaktinagar,
Mumbai-94

CONTACT

Dr. D. N. Badodkar, Chairman & Convener
Dr. T. A. Dwarakanath, Co-Convener

Ph: +91 22 2559 2545
Email: inacomm2017@barc.gov.in

DRHR, BARC, Trombay
Mumbai- 400085, India

3rd International and 18th National Conference on Machines & Mechanisms

iNaCoMM 2017

December 13-15, 2017

Organized by

Division of Remote Handling & Robotics
Bhabha Atomic Research Centre
Mumbai

FIRST CALL FOR PAPERS

www.inacomm2017.org

INVITATION

The Division of Remote Handling & Robotics, BARC is organising 3rd International and 18th National and Conferences on Machines and Mechanisms during December 13-15, **2017** (iNaCoMM 2017) at Anushakti Nagar, Bhabha Atomic Research Centre, Mumbai, India.

iNaCoMM 2017 is the 18th National and 3rd International conferences on Machines and Mechanisms organized under the aegis of AMM and IFToMM. The conference aims at bringing together researchers, industry experts and students, working on various aspects of design and analysis of machines, mechanisms and robotics, to deliberate through oral, poster and design contest presentations on recent, novel advances.

iNaCoMM 2017 will feature eminent researchers from India and overseas, as plenary speakers. Each day there will be plenary talk by an eminent scientist followed by interesting morning and afternoon presentation/poster sessions on the topics of the conference. The iNaCoMM 2017 will also host Mechanism Design Contest for Students. There will be recreational performances, music and dance nights are also planned from troops of Art & Culture Associations.

Mumbai and its surroundings are famous for world heritage monuments, art and cultural museums, beautiful hill stations, beaches and islands. Mumbai is a financial capital of India and the famous Bollywood, the Indian Film Industry dwell here. The city offers a cosmopolitan and diverse lifestyle with variety of food and entertainment. During December the climate in Mumbai is generally pleasant. The city is well connected to the various parts of the country by roadways, by railways and by airways. The important tourist places like Ajanta, Ellora, Goa and many west coast beaches, are easily reachable with multiple transport options. The international airport offers direct flight to the various destinations of the world. We hope that besides the enriched scientific flavour of the Conference, you will also enjoy the verdant campus of Anushakti Nagar during your stay.

The Organizing Committee of the Conference extends its invitation to researchers working on the topics of the conference.

SCOPE OF THE CONFERENCE

The scope of iNaCoMM 2017 are, but not limited to, the following topics:

Theoretical and Computational Kinematics:
Analysis, Synthesis, Design, Modelling and Simulation of Mechanisms or Machines.

Robotics:
Robot Kinematics and Robot Dynamics, Serial and Parallel manipulators, Master-Slave Manipulators, Telerobotics, Industrial Robots, Service robots, Autonomous robots, Collaborative and Cooperative Robotics, Distributed and Cloud Robotics, Internet of Robotics, Walking Robots and Humanoids, Wheeled Mobile Robots, Autonomous Vehicles, Swarm and Flying Robots, Under-Water Robotics, Space Robotics, Application of Robotics in Nuclear industry, Hazardous material handling, Decommissioning, Robot applications in Agriculture, Defense, Medical & Surgical Robotics, Wearable Robotics.

Machine and Mechanism Intelligence:
Mechatronic Systems, Automation for Machine Tools, Manufacturing Automation, Process Automation, Machine Learning and Artificial Intelligence, Virtual Reality, Haptics, Telepresence, Human-Machine Interfaces and Interactions, assistive, and rehabilitative technologies.

Mechanisms & Devices:
Compliant Mechanisms, Micro-Nano Machines and Mechanisms, Biologically inspired mechanisms, Bio-medical devices, Mechanisms and Machines for Rural Applications and Agriculture.

Design & Manufacture:
Origami-Based Engineering Design, Image and 3D-Print based Modeling and Manufacturing.

Dynamics of Machinery:
Dynamics and Vibration Analysis in Machines, Fault Diagnosis and Health Monitoring, Dynamics and Control of Multi-body Systems.
History and Future trends: In Machines, Mechanisms and Robotics.

BEST PAPER AWARDS

Two Best Paper Awards, one in general category and other in student category will be handed over by the Association for Machines and Mechanisms. Both awards carrya cash prize along with a citation.

ORGANIZING COMMITTEE

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www.inacomm2017.org

www.inacomm2017.org

iNaCoMM 2017

December 13-15, 2017

www.inacomm2017.org

SMDC

Student Mechanism Design Contest

Objective:

One of the key objectives of the Association for Machines and Mechanisms (AMM) is to promote innovation among the students. A mechanism design contest has been integral part of iNaCoMM since 2009. The purpose of the competition is to encourage the students to apply their theoretical knowledge in the domain of mechanisms and machines to solve problems relevant to the society.

Eligibility:

Participation is restricted to individuals/groups of students (up to three members), who should be registered as full-time students/research scholars/project staff in recognized institutes.

Participation:

Participants are invited to submit proposals for design, construction and operation of mechanisms which are innovative and capable of solving a challenging design problem. The design problem may be chosen from a wide range of application domains - from agricultural and rural technology to automobile and aerospace engineering.

Guidelines:

- Participants must submit a 2-page proposal outlining the design challenge and novelty/innovation of the proposed design. The proposals have to be submitted through email, with the subject line **"Proposal for the Student Mechanism Design Contest"** to the email address: inacomm2017@barc.gov.in
- The winner will be decided based on the extent of innovation, difficulty of the design challenge, effectiveness of the proposed solution towards solving the actual problem etc.
- In any matter related to the contest, the decision of the judges and/or the organisers will be final and binding.
- Finished prototypes are to be demonstrated during iNaCoMM 2017 (December 13 - December 15, 2017) before a panel of judges.
- The finalists will be provided with TA/DA.

- **1st Prize: ₹10,000**
- **2nd Prize: ₹6,000**
- **3rd Prize: ₹4,000**

All participants will be awarded with Certificates from AMM

Important Dates

- **Submission of Proposal - 25th September, 2017**
- **Result of 1st Round Elimination - 10th October, 2017**
- **Submission of Detailed Design - 10th November, 2017**
- **Result of 2nd Round Elimination - 20th November, 2017**
- **Demonstration by Finalist - 13th-15th December, 2017**

3rd International and 18th National Conference on Machines & Mechanisms

IFToMM

Organized by

Division of Remote Handling & Robotics

Bhabha Atomic Research Centre Mumbai

Advances in Robotics (AIR 2017)

3rd International Conference of Robotics Society of India
June 28-July 2, 2017
Indian Institute of Technology Delhi, New Delhi, India

SECOND CALL FOR PAPERS

Advances in Robotics (AIR) is a series of biennial conference organized by the Robotics Society of India. The conference aims to create a forum to present and exchange new ideas by researchers and developers from India and abroad working in the fields of robotics and its applications. The conference would have plenary talks, oral and poster presentations, and special industry oriented sessions.

AIR 2017, will be held at IIT Delhi, New Delhi, during June 28-July 2, 2017. The previous two editions of AIR were held at R&DE, DRDO Pune (AIR 2013) and BITS Pilani Goa Campus, Goa (AIR 2015). The conference website is http://www.advancesinrobotics.com

Contributed Papers

The organizers of the conference invite unpublished research work in the following fields of Robotics (representative and non-exhaustive):

- Kinematics, dynamics, control and simulation of autonomous intelligent systems
- Design of robotic mechanisms
- Man-machine interface and integration
- Robotics-related computer hardware, software, and architectures
- Navigation of Unmanned vehicles – ground, aerial, underwater
- Machine learning and artificial intelligence for robotics
- Bio-mimetic and Bio-inspired Robotic Systems
- Vision and other non-contact sensory systems
- Tactile and other contact sensory technology
- Active sensory processing and control
- Medical and Assistive Robotics
- Swarm Robotics
- Humanoid Robots
- Safe Robots
- Robotic Hand
- Virtual Reality & Haptics
- Tele-robotics

Plenary Talks

The following plenary/keynote speakers will be giving a talk:

- Prof. Peter Corke, QUT, Australia
- Prof. Nancy Amato, Texas A&M Univ, US
- Prof. Burkhard Corves, Aachen Univ, Germany

Workshop and Tutorials

A full day workshop and/or tutorials will be held during the conference. The details on the workshop would be made available on the conference website.

Doctoral Symposium

A symposium will be held for the PhD students working in all areas relevant to robotics. It would provide an opportunity to showcase their ongoing research work and interact with experts in the field. More details on the conference website.

Submission Instructions

Research papers have to be submitted in double column ACM format. There is a maximum page limit of 6. The submitted papers will undergo peer-review process. The template and instructions are available on the conference website.

Proceedings

All the accepted papers, after incorporation of the reviewers comments, will be published by ACM.

Important Dates

Full Paper Submission Deadline: **Feb 1, 2017**
Announcement of Results: April 10, 2017
Camera Ready Version: May 5, 2017
Doctoral Symp. Deadline: May 5, 2017
Doctoral Symp. Results: May 25, 2017
Conference: June 28- July 2, 2017

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Organized by:

IIT Delhi

Proceedings:

Published by ACM

acm

http://www.advancesinrobotics.com

The 12th IFToMM International Symposium on Science of Mechanisms and Machines SYROM'2017

Iasi, Romania, November 02-03, 2017

Organized by:
Romanian Association for the Science of Mechanisms and Machines - ARoTMM
and
"Gheorghe Asachi" Technical University of Iasi, Mechanical Engineering Faculty

With the support of:
International Federation for the Promotion of Mechanism and Machine Science – IFToMM

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Aim
The aim of the symposium is to bring together researchers, scientists, industry experts and PhD students to provide a general forum for researchers, engineers and PhD students involved in the general area of mechanisms and machines, and their applications, to disseminate their latest research results and exchange views on the future research directions of these fields.

Topics
We are looking for original, high-quality contributions on topics related to mechanisms within aspects of theory, design, practice and applications in engineering, including but not limited to:

- Theoretical kinematics
- Computational kinematics
- Mechanism design
- Experimental mechanics
- Mechanics of robots
- Dynamics of machinery
- Dynamics of multi-body systems
- Control issues of mechanical systems
- Mechanisms for biomechanics
- Novel designs
- Mechanical transmissions
- Linkages and manipulators
- Micro-mechanisms
- Teaching methods
- History of mechanism science
- Industrial and non-industrial applications

Submission, presentation and publication
The official language of the symposium is English. Each paper will be reviewed, and the papers selected by the Scientific Committee will be published in a book edited by Springer, Mechanisms and Machine Science series. Only papers with at least one author as registered participant will be included into the conference volume. All submitted papers must be strictly prepared following the publication guidelines. For detailed up-to-date information, please visit the SYROM'2017 conference website.

Deadlines

Full paper submission:	April 15th, 2017
Prov. accept. notification:	June 1st, 2017
Final paper submission:	July 10th, 2017
Final accept. notification:	July 20th, 2017

Registration

"Early Bird" Registration (before August 1st, 2017)

IFToMM Members	250 €
Non IFToMM Members	350 €

Regular Registration

IFToMM Members	350 €
Non IFToMM Members	450 €
Students/Accompanying Persons	150 €
Excursion, November 04th, 2017	25 €

Venue
The conference will be held at "Gheorghe Asachi" Technical University of Iasi. Iasi is the largest city in eastern Romania, located in the historical region of Moldavia. Iasi has traditionally been one of the leading centres of Romanian social, cultural, academic and artistic life. Known as *The Cultural Capital of Romania*, Iasi is a symbol in Romanian history. It is easily accessible from countries by plane, train or car (see website).

Accommodation
Iasi provides accommodation in several hotels of different categories. A list of hotels will be available on the conference website.

Excursion
Directly after the conference there will be an Excursion day.

Further information
This is the first call for papers intended to inform about the aim, topics and important dates of the symposium. Detailed information about venue, accommodation, social program and other topics will be published on the website.

Correspondence Address:
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Prof. Cezar OPRISAN
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idoroftei@mail.tuiasi.ro
coprisan@mail.tuiasi.ro

Website
http://www.mec.tuiasi.ro/syrom2017

The 4th Conference on Mechanisms, Transmissions and Applications (MeTrApp 2017) at Trabzon, Turkey

(July 03-05, 2017)

The 4th Conference on Mechanisms, Transmissions and Applications (MeTrApp 2017) will be organized by Karadeniz Technical University, Mechanical Engineering Department in Trabzon, Turkey on July 3-5. The call for papers and the detailed information are provided at the conference website: http://metrapp2017.ktu.edu.tr/

MeTrApp 2017 is organized under the patronage of International Federation for the Promotion of Mechanism and Machine Science (IFToMM). The researchers are welcome to submit their high quality and original research papers relevant to the conference topics:

* Mechanisms and Machine Design
* Mechanical Transmission
* Mechatronics
* Computational and Experimental Methods
* Dynamics of Mechanisms and Machines
* Micromechanisms and Microactuators
* Biomechanics and Medical Engineering
* Industrial Applications

We are looking forward to your contributions to MeTrApp 2017 and hope to meet you in Trabzon, Turkey.

Contact:

Dr. Mehmet ITIK (Conference Chair)
Department of Mechanical Engineering
Karadeniz Technical University,
Trabzon, Turkey

Call for Papers for the 41st Mechanisms and Robotics (MR) Conference

(August 6-9, 2017)

@ ASME 2017 International Design Engineering Technical Conferences https://www.asme.org/events/idetccie

Abstract and Final Draft Paper Due: February 10, 2017

The 41st ASME Mechanisms and Robotics (MR) conference will be held as part of the 2017 ASME International Design Engineering Technical Conferences & Computers & Information in Engineering Conference (IDETC/CIE) in Cleveland, OH, August 6-9, 2017.

Since 1952, the ASME Mechanisms and Robotics (MR) conference has provided an international forum for the exchange of technical and scientific information on the theory and practice of mechanical and robotic systems. Topics span areas central to design and analysis of mechanical, mechatronic, and robotic systems, including kinematics, dynamics, novel mechanisms and robots, software systems, educational practices, and various applications. Papers are particularly encouraged from the areas in soft-, flexible- and human-safe robots, reconfigurable mechanisms and robots, origami-based systems, rehabilitation and medical robots, and exoskeleton/prosthesis design and development.

Submitted papers will be eligible for the Mechanisms and Robotics Best Paper, Freudenstein/ General Motors Young Investigator, A.T. Yang Memorial, and Compliant Mechanism awards. Authors of the strongest papers at the conference will also be invited to submit enhanced archival versions to an IDETC Special Issue of the Journal of Mechanisms and Robotics.

The MR conference will host the following symposia:

MR-1 Mechanism Synthesis & Analysis
MR-2 Theoretical & Computational Kinematics
MR-3 Compliant Mechanisms
MR-4 Origami-Based Engineering Design
MR/MNS-5 Micro/Nano-Scale Robotics & Manufacturing
MR/MSNDC-6 Motion Planning, Dynamics & Control
MR-7 Medical & Rehabilitation Robots
MR-8 Novel Mechanisms, Robots & Applications

CONFERENCE ORGANIZERS:

Andreas Mueller (Johannes Kepler Uni., Linz, Austria, a.mueller@jku.at)
James Schmiedeler (Uni. of Notre Dame, IN, James.P.Schmiedeler.4@nd.edu)
Philip Voglewede (Marquette Uni., WI, philip.voglewede@marquette.edu)

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