MEMORANDUM OF UNDERSTANDING

The memorandum of understanding made on this 23... day January month ...2019..... year between Defence Institute of Advanced Technology, (hereafter referred to as DIAT) and Alva,s Institute of Engineering and Technology, (hereinafter referred to as AIET) as per the mutual interests in the fields of research, education, training and dissemination of knowledge.

AIET and DIAT agree to establish a collaboration according to terms and conditions set out in the following areas as described below.

The words the two institutions in the Memorandum of Understanding refer to the Defence Institute of Advanced Technology, Pune, India and Alva,s Institute of Engineering and Technology, Mijar, Mangalore, India.

1. FIELD OF CO-OPERATION

Co-operation between the two institutions may be established within any field related to science and technology of mutual interest.
Extension to other areas will be made through further amendments to the present Memorandum of Understanding.

2. EXCHANGE OF SCIENTISTS/FACULTY :

2.1. AIET and DIAT will encourage collaboration in research areas of mutual interest. AIET will welcome faculty and researchers from DIAT to visit different departments in AIET to engage in scientific research and other academic activities.

Reciprocally, DIAT will welcome faculty and researchers from AIET to visit DIAT in order to engage in scientific research and other academic activities.

2.2. Both institutions agree to seek financial support for co-operative activities from appropriate funding agencies. Proposals concerning the topics, persons and periods of visits will be sent within a reasonable time in advance of the proposed visit.

3. EXCHANGE OF STUDENTS

3.1. AIET and DIAT agree for academic exchange of students not exceeding a maximum duration of 12 months in each case covering course crediting, research and internship. The scope of such exchange will conform to the norms in practice prevailing at the host institution.

3.2. The students under this programme will follow all rules, regulations and discipline as applicable to regular students of the host institution.

3.3. The participating students will continue as students of the parent institution and obtain degrees of the parent institution after due qualification.

3.4. The exchange programme will be implemented on case-by-case basis after due documentation and consultation among concerned faculty, departments and administrative units of each institution,

3.5. The resources required to meet the academic pursuit of participating students will be facilitated by the concerned Departments depending on the availability.

Atul

4. RESEARCH PROJECTS:

4.1 Efforts will be made to share information about on-going research activities in order to establish contacts and collaboration between professionals working within the same field.

4.2 Research Projects and the composition of research teams will be approved by the participating institutions. Efforts will be made to evaluate the need for participating staff and the location of the research activity.

4.3 Every research project will have a team leader, who will be responsible for reporting on the project status.

5. INTELLECTUAL PROPERTY RIGHTS (IPR):

5.1. Information on research results and scientific materials (reports, articles, books) will be exchanged freely keeping in mind the mutually agreed provision of Intellectual Property Rights, All intellectual property solely conceived and/or developed by DIAT, Pune during the course of this Agreement shall be owned by ER&IPR cell of DRDO Hqrs. All intellectual property solely conceived and/or developed by AIET during the course of this agreement shall be owned by AIET. Intellectual property jointly conceived and/or developed by AIET and DIAT will be jointly owned by AIET and ER&IPR cell of DRDO Hqrs. Research articles can be published with intimation of DRDO Hqrs. Patents will be as per DRDO Hqrs guideline. Each party may use such property for research and scholarly purposes. AIET and DIAT through ER&IPR cell of DRDO Hqrs will be committed to the protection, if appropriate, and application of such intellectual property for commercial or other purposes on mutually acceptable terms to be negotiated in good faith between AIET and DIAT through ER&IPR cell of DRDO Hqrs.

5.2. AIET and DIAT shall acknowledge one another in any form of writing, publication or presentation based on research derived from the cooperative efforts of both parties under this MoU unless otherwise mutually agreed upon in writing by the parties.

6. FUNDING AND FINANCE:

6.1. The two institutions will seek funding for the link programme from various sources.

6.2. The acquired funds will be subject to accounting procedures of the institution where the funds are operated.

6.3. The collaborating institutions will offer logistic support for initiating the collaboration and for working out draft proposals for the activities.

7. MANAGEMENT AND ADMINISTRATION:

7.1 Negotiation, implementation and co-operation of the Memorandum of Understanding falls under the responsibility of

Principal

Alva,s Institute of Engineering and Technology

Mijar, Mangalore-574225

And

Registrar

Defence Institute of Advanced Technology (DIAT), Girinagar,
Pune — 411 025

7.2 Issues about specific activities including rights and obligations of each party shall be notified or communicated to the offices mentioned in 7.1 above.

7.3 This Memorandum of Understanding shall have a duration of 05 years and be renewable for another 5 years, unless either party gives notice of termination not later than 6 month prior to the expiration of the existing Memorandum of Understanding. However, either party can also terminate by giving notice of termination not less than 3 months.

7.4 The Memorandum of Understanding will take effect upon ratification by the Principal, AIET, Mijar and Registrar, DIAT, Pune

8. GENERAL PROVISIONS:

8.1 The two institutions will carry out research activities, as a follow up to this Memorandum of Understanding. The activities must be carried out in accordance with appropriate laws and regulation existing in each institution.

8.2 The two institutions shall initiate and exchange research publication lists and other publications relevant to the project. This will be provided with adequate security as far as intellectual property laws are concerned under the terms of this Memorandum of Understanding.

8.3 All publications resulting from the collaboration between the two institutions will be mentioned In the scientific reports of the institutions. Likewise, this Memorandum of Understanding must also be mentioned in all formal presentations which result from the collaborate.

8.4 Any disputes/disagreement not possible to be resolved shall be decided through theCourt of Law in the respective jurisdiction of the two Institutions.

IPAL ..... PRINCIPAL Alva's Institute of Engg. & Technology Mijar, MOODBIDRI - 574 225 ,s Institute of Engineering & Technology, galore.	REGISTRAR ..... (Atul Kumar Sinha) Cmde (Retd) Registrar Defence Institute of Advanced Technology (Deemed University) Girinagar, Pune-411 025. Defence Institute of Advanced Technology (Deemed University), Pune
SSE FROM AIET nature: ne: Brig Ravindran KN (Retd) le: 23 Jan 2019	WITNESSE FROM DIAT Signature: KP Ray Name: Prof K.P. Ray Date: 23/01/2019

PRINCIPAL
Alva's Institute of Engg. & Technology
Mijar, MOODBIDRI - 574 225, D.K

"EXPLOSIVES AND THEIR MILITARY AND NON-MILITARY APPLICATION"

By

Dr. Suresh G Kulkarni
Adjunct Professor
Defense Institute of Advanced Technology (DU), Girinagar
Pune – 411025

A talk on the topic *"Explosives and their Military and Non Military Application"* was delivered by Dr. Suresh G Kulkarni on 16th September 2019 as a Departmental Forum Activity.

In the talk he spoke about types of explosion which include mechanical, nuclear and chemical. He mainly spoke about the applications of these explosives in various field. He started his session by giving a brief introduction on missiles and its requirements. He gave details about the substances which are explosives like peroxides/ozonides, chlorates/perchlorates, nitro azides fulminates acetylides halides of nitrogen organometalic etc.

He gave the classification of explosives and explained about the type of explosives used in different military applications. Nature of military explosives compounds include compounds of carbon, hydrogen, nitrogen and oxygen arranged in a

particular sequence like C-H-N-O where C-H are Fuel Elements, O is oxidizer N is binder/Bridge between fuel and oxidizer.

Talk by Dr. S G Kulkarni

He explained about the role of nitrogen in explosives which includes acting as a bridge between fuel and oxidizer imparts explosive property in the form of 'nitro' (no_2) group on initiation, nitrogen is knocked off and comes out as N_2 gas which contributes to gaseous output as well as heat of explosion nitrogen in the form of 'amino' group (NH_2) imparts heat resistance / improved stability nitrogen rich compounds – emerging as new insensitive yet powerful high explosives.

Classification of Explosives

He gave enormous examples of explosives and he classified it as primary and secondary explosives.

PRIMARY EXPLOSIVES	MOLECULAR FORMULA
MERCURY FULMINATE	$(C_2N_2O_2Hg)$
LEAD AZIDE	(PbN_6)
LEAD STYPHNATE	$(C_6H_3N_3O_9P_b)$
TETRAZENE	$(C_2H_8N_{10}O)$
SECONDARY EXPLOSIVES	
NITROGLYCERINE	$(C_3H_5N_3O_9)$
NITROCELLULOSE	$[C_6H_70_2(OH)x(ONO_2)y)]$
PICRIC ACID	$C_6H_3N_3O_7$
TETRYL	$C_7H_5N_5O_8$
TNT	$C_7H_5N_3O_6$
NITROGUANDINE (NQ)	$CH_4N_4O_2$
PETN	$C_5H_8N_4O_{12}$
RDX	$C_3H_6N_6O_6$
HMX	$C_4H_8N_8O_8$
ETC.	

Types of Explosives

Explosives cannot be used in loose powder form for reasons of safety and reliability in initiations and performance. So they are converted into different forms like cast, pressed, extruded, putties (Plastic explosives), Plastic bonded explosives, sheet explosives (Rolled) etc.

Explosives release their energy by decomposition when suitably initiated. This decomposition reaction is 'combustion' reaction. This combustion is of two types

a) Deflagration: Initiated by flame, heat, spark, friction

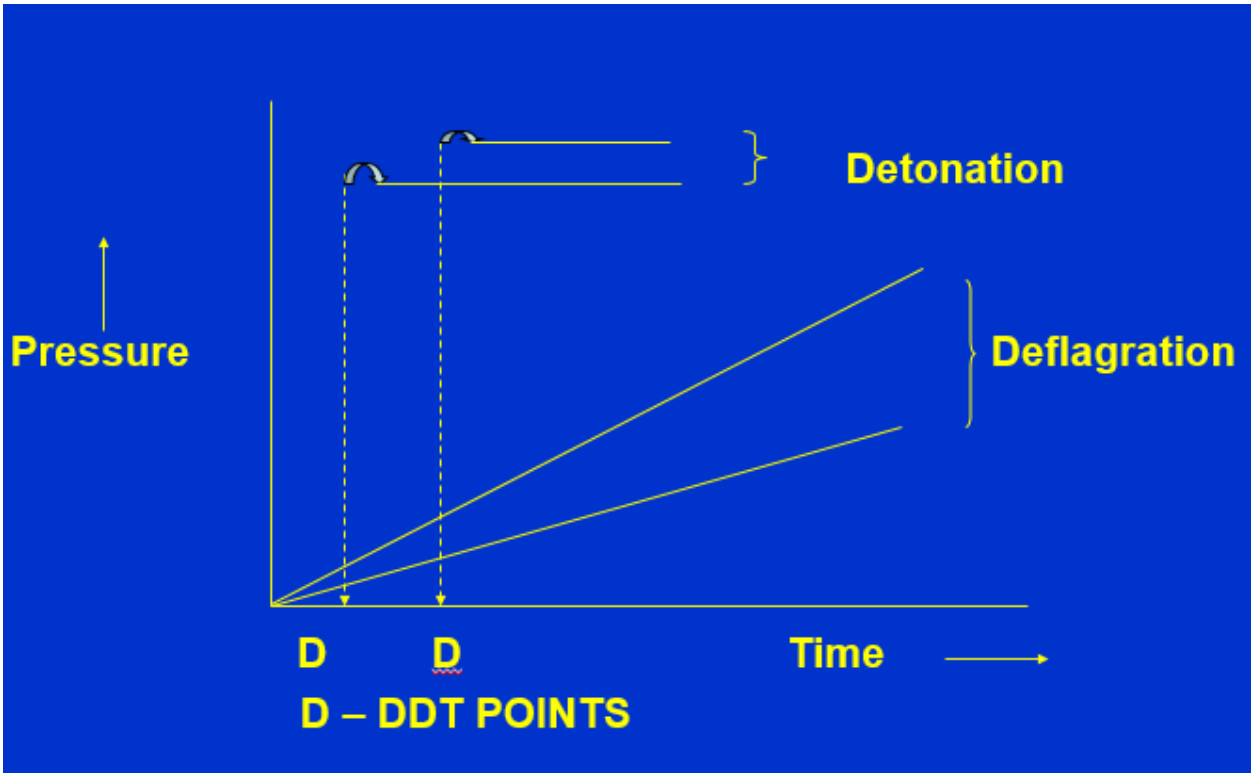
b) Detonation: Initiated by shock (shock phenomenon)

Deflagration may sometime get converted into detonation if conditions are favorable. This is called as 'Deflagration to Detonation Transition' (DDT)

If $r \geq 1000$ m/s – low order detonation

$r \geq 5000$ m/s – high order detonation

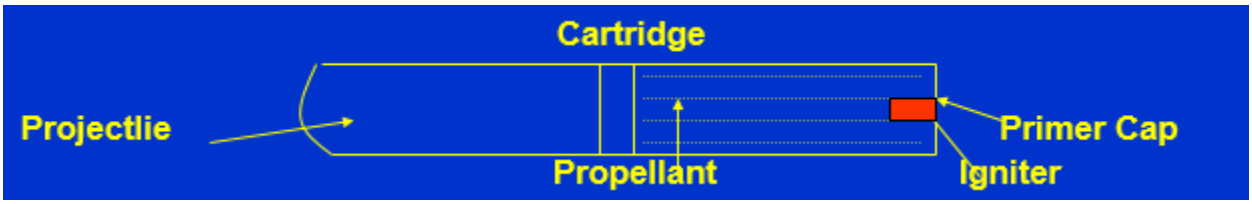
Conditions for DDT are degree of confinement, material thickness magnitude of energy produced surface area, particle size.



P-t Profile

Explosives (propellant or high explosive) must be initiated by use of 'explosive train' only. Explosive train is an arrangement used to lead explosive reactions from one place to another. A great deal of safety & reliability is achieved by use of 'trains'.

Unintended initiations of ammunitions can be avoided.



Propellant Train

The functions of each components of propellant were explained by the speaker. Primer cap is used to give a spit of flame when initiated (by impact etc). Igniter gives longer lasting flame / hotter flames. Propellant responds to strong / hot flames from igniter burns rapidly to produce hot gases (for propulsion).

He then explained about different application of explosives like in military war-head filling in-shells, bombs, grenades torpedoes, shaped charges and missiles. In commercial coal mining, tunneling, other mining, detonating cords, canopy severance systems, air crew ejection systems, high altitude fuel , air re-generating composition. In nuclear triggering device for implosion type of weapon based on fission or fusion. In space launch vehicles for stage separation. In metallurgical metal- metal bonding explosive metal working - explosive cladding, welding cop action forming and in agriculture, medical industry, food industry, oil and gas industry.

He concluded the session by urging students and faculties to be part of the explosives based research and also suggested final year students to do project based on the same as there is an MOU signed between both the institutes. Both faculties as well as students are welcome to the institute any time and can conduct their work there.

The session was concluded with an interaction with students and faculties.

A token of appreciation was awarded by Prof K V Suresh

Talk on "EXPLOSIVES AND THEIR MILITARY AND NON-MILITARY APPLICATION"		
VENUE : SEMINAR HALL, MBA BLOCK		
Attendance (16/09/2019)		
7th ME A		
SL no.	**USN**	**Name**
1	4AL15ME001	Abhinav Anilkumar
3	4AL15ME009	Akahay babu G k
4	4AL15ME012	Akshay p
5	4AL15ME019	Ashik Santhosh
6	4AL15ME020	Ashrith Kumar J
7	4AL15ME021	Athulkrishnan
8	4AL15ME030	Darshan Krishna Deshbhandari
9	4AL15ME102	Shravan
10	4AL16ME003	Abhishek H Shetty
11	4AL16ME006	Akhil Mohan
12	4AL16ME007	Anil Kumar
13	4AL16ME009	Bavin I
14	4AL16ME010	Blesson Xavier
15	4AL16ME011	Chandrashekar Kulal
16	4AL16ME012	Chethan N
17	4AL16ME013	Chinmaya G A
18	4AL16ME014	Chirag Poojari
19	4AL16ME015	Moolya Divyaraj Raghu
20	4AL16ME016	Ganesh V Kadappanavar
21	4AL16ME017	Harikrishna Raju
22	4AL16ME018	S A Hithesh Raj
23	4AL16ME019	Karthik S Mendon
24	4AL16ME020	Kevin Joseph Lobo
25	4AL16ME021	Kiran Kumar
26	4AL16ME022	Kishore Kumar A
27	4AL16ME028	Manojgowda K N
28	4AL16ME029	Manoj Kumar D
29	4AL16ME031	Mervin Lawrence D' Almeida
30	4AL16ME032	Mohammad Faiz
31	4AL16ME033	Moosa Nizamuddin
32	4AL16ME035	Nagasundar K S
33	4AL16ME036	Naveen A
34	4AL16ME038	Naveen H R
35	4AL16ME040	Nikhil H S
36	4AL16ME043	Parthasarathy D J
37	4AL16ME044	Poojari Prashant Shekar
38	4AL16ME045	Poojary Hiten Umesh
39	4AL16ME048	Prashanth Naik K
40	4AL16ME049	Pujeeth Kulal

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7th ME B		
SL no.	**USN**	**Name**
1	4AL15ME027	ChetanKumar
3	4AL15ME077	Yash raj shetty
4	4AL15ME088	Vidyasheesh Patel
7	4AL16ME053	Rakesh A
8	4AL16ME054	Rakesh R
9	4AL16ME057	Rakshith
10	4AL16ME059	Rakshith Kotain
11	4AL16ME060	Rakshith R
12	4AL16ME061	Ravi Nimboni
13	4AL16ME063	S Nikhilesh
14	4AL16ME064	Sachin B U
15	4AL16ME065	Sagar M
16	4AL16ME066	Sanjay S
17	4AL16ME067	Santhosh G B
18	4AL16ME068	Santhosh Chndrashekhar
19	4AL16ME069	Shaik Mohamad Safwan
20	4AL16ME070	Shetty Adit Arvind
21	4AL16ME072	Shetty Gaurav Ramesh
22	4AL16ME073	Shetty Manoj Manmatha
23	4AL16ME074	Shetty Pranay Radhakrishna
24	4AL16ME076	Shetty Rohith Jayaprakash
25	4AL16ME077	Shikhar V Raj Jain
26	4AL16ME078	Shivakumar Kataraki
27	4AL16ME080	Sohan Poojari S S
28	4AL16ME081	Sonal Tomy
29	4AL16ME082	Soufia N Shaikh
30	4AL16ME084	Sudheera
31	4AL16ME085	Sharma Sunny Ramnivas
32	4AL16ME086	Tanay S K
33	4AL16ME087	Tejas B
34	4AL16ME088	Thejesh R
35	4AL16ME089	U Gobind
36	4AL16ME090	Udayakumar L A
37	4AL16ME091	Venkatesh Ragam
38	4AL16ME093	Vikas D S
39	4AL16ME094	Vishal Sridhaya P
40	4AL16ME095	Vishnu

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7th ME C		
SL no.	**USN**	**Name**
1	4AL14ME062	Nikhil P
2	4AL14ME074	Rajath Raj U.K
3	4AL14ME096	Shravika K A
6	4AL15ME039	Jyothi A
7	4AL15ME086	Veeresh Biradar
8	4AL15ME721	Pavan S
10	4AL15ME730	Nidesh Shetty
11	4AL15ME733	Sujeeth M
12	4AL16ME097	Seemashwori Devi
13	4AL16ME098	Jyothi S
14	4AL16ME099	Rakshith C
15	4AL16ME100	Prasanna Venkatesh
16	4AL16ME102	Shashank CM
17	4AL16ME103	Sumith Kumar
18	4AL16ME104	Vivekanada C N
19	4AL16ME431	Somashekar
20	4AL16ME702	Anil Kumar G R
21	4AL16ME703	B S Abhishek Acharya
22	4AL16ME711	Kirankumar B Basanagoudar
23	4AL16ME712	Madesha N
24	4AL16ME713	Manjunath M G
25	4AL16ME714	Manoj Honnappa Sannamani
26	4AL16ME716	Puneeth Kumar C M
27	4AL16ME717	Rashmitha
28	4AL16ME718	Raveena
29	4AL16ME719	Santhosh K B
30	4AL17ME400	Ashik Rai
31	4AL17ME401	Bharath N
32	4AL17ME402	Bindushree G R
33	4AL17ME403	G N Sthavarmath
34	4AL17ME404	Janani M
35	4AL17ME405	Jayanth S
36	4AL17ME406	Mahesh Kumar BO
37	4AL17ME407	MohanKirshna M G
38	4AL17ME408	Mohsin Fayad khan
39	4AL17ME409	Muttanna Bhangi
40	4AL17ME410	Nayak Rachit Jagannath

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5th ME A		
SL no.	**USN**	**Name**
1	4AL16ME001	Abdul Rahim
2	4AL16ME034	Mounesh
3	4AL16ME055	Rakesh Shetty
4	4AL16ME101	Manoj B
5	4AL16ME106	Pavan Kumar R
6	4AL17ME001	Abdul Rahiman
7	4AL17ME002	Abhijith
8	4AL17ME003	Adithya Nayak
9	4AL17ME005	Adithya Rathore
10	4AL17ME007	Akshay Kulal
11	4AL17ME008	Akshay Kumar S
12	4AL17ME009	Alisab Mahamadsab
13	4AL17ME010	Anson Dmello
14	4AL17ME012	Arjun R
15	4AL17ME013	Ashutosh R Shivanagodar
16	4AL17ME018	Charan M S
17	4AL17ME020	Chirag K R
18	4AL17ME021	Devaraj P Sataraddi
19	4AL17ME022	Girish L
20	4AL17ME024	Harshavardhana Achari L S
21	4AL17ME025	Harshith G B
22	4AL17ME026	Hemanth P
23	4AL17ME027	Husenbasha
24	4AL17ME028	Inamdar Pavan Raghavendra
25	4AL17ME030	Karan H S
26	4AL17ME031	Karthik Prabhu
27	4AL17ME032	Kishor H H
28	4AL17ME034	LaxamannaB Hebbal
29	4AL17ME036	Mithesh Gowda J R
30	4AL17ME037	Musthak Ahamed T H
31	4AL17ME038	N Sunil Naik
32	4AL17ME039	Nandeesh M Hiremath
33	4AL17ME040	Naveen Kumar M C
34	4AL17ME041	Pavan
35	4AL17ME043	Gawda Purushotham Nagesh
36	4AL17ME044	R Uma Shankar
37	4AL17ME045	Raghavendra M G
38	4AL17ME046	Rahul H N
39	4AL17ME047	Rajnish Kumar Mishra
40	4AL17ME049	Rakshak Rai

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5th ME B		
SL no.	**USN**	**Name**
1	4AL16ME706	Chandrashekhar
2	4AL16ME707	Fakkiresh Bhajantri
3	4AL16ME715	Mohammed Sohail
4	4AL17ME017	Chandana G S
5	4AL17ME058	Sanjay M
6	4AL17ME059	Shantha Kumar N
7	4AL17ME060	Shashank V Poojary
8	4AL17ME061	Ritvik S Shetty
9	4AL17ME062	Shetty Sanket Sudhakar
10	4AL17ME063	Shetty Yashas Balakrishna
11	4AL17ME064	Shravankumar
12	4AL17ME066	Shrivatsa
13	4AL17ME067	Sidharth S
14	4AL17ME068	Singh Nikhil Devendra
15	4AL17ME069	Sourabh
16	4AL17ME070	Soyab P Nadaf
17	4AL17ME071	Sree Raksha S
18	4AL17ME072	Srivathsa H S
19	4AL17ME073	Sudarshan B
20	4AL17ME074	Sudeep Kumar Jain
21	4AL17ME076	Sujan Shekar H.S
22	4AL17ME077	Suman Singh
23	4AL17ME078	Suraj Koli
24	4AL17ME080	Tajuddin H I
25	4AL17ME081	Dhaxith Thachery
26	4AL17ME083	Veena V
27	4AL17ME084	Vignesh K R
28	4AL17ME085	Vignesh Ps
29	4AL17ME086	Vikas Sk
30	4AL17ME087	Vineeth.R.Shetty
31	4AL17ME088	Vinodraj
32	4AL17ME089	Viresh B Sirimani
33	4AL17ME090	Vishal S
34	4AL17ME092	Chandrika M
35	4AL17ME093	Asha N B
36	4AL17ME418	Shravan Kumar
37	4AL17ME700	Amara N S
38	4AL17ME701	Ashish S Shetty
39	4AL17ME702	Keerthinath B M
40	4AL17ME703	Pavan R

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