

## INTRODUCTION

The number of countries possessing nuclear weapons is large, but the number of countries having the knowhow for making stealth aircraft is limited. Hence, *Stealth Technology*, provides a quantum leap in military power and will shape future warfare. Stealth technology is kept as a closely guarded secret by the countries possessing it. There is a dearth of information in the open literature, which has resulted in several schools of opinion and consequently misconceptions also. Therefore, there is a need for a consolidated and comprehensive course, aimed at demystifying this topic. Also, the proliferation of Infra-Red (IR) guided MAN Portable Air Defence Systems (MANPADS) including with terrorist groups, have emerged as a major cause of aircraft and helicopter loss in tactical warfare and skirmishes.

## COURSE OUTLINE

- Principles of Stealth – camouflage, conceal, deceive;
- Active vs. Passive detection;
- Mission Attainment Measure, Aircraft Survival rate, Measure of Mission Success, & Mission Goal;
- Survivability, Susceptibility, Vulnerability of Aircraft & Helicopter in Human-made Hostile Environment;
- Precision Guided Weapons & Role of Stealth Aircraft;
- Introduction to Aircraft Signatures – radar (Radar Cross-Section & its reduction), IR, Visual, Aural;
- Introduction to Materials for Stealth;
- Stealth related to air-intakes;
- Stealth related to UCAV design;
- Basics of high frequency RCS of aerospace & naval targets;
- Extremely low frequency electric field modeling & reducing signatures;
- RCS computations for realistic geometries - issues & challenges;
- Design synthesis & modeling of Radar Absorbing Materials;
- Aero-acoustic field & its modeling;
- Simulation & mitigation of laser lethality;
- Principles of IR Radiation – basic laws (Planck's, Wien's Displacement, Kirchhoff's), Grey Body spectrum of Solid Surfaces vs. Line & Narrow Band Emission from Unsymmetrical Gases [e.g. CO<sub>2</sub>, H<sub>2</sub>O (vap.)];
- IR Signatures in 2–3 μm, 3-5 μm, 8-12 μm;
- IR Signatures from Internal Sources – engine heated casing, engine exhaust plume, aerodynamic heating of air-frame in supersonic aircraft;
  - Simulation of plume for IR signature;

- IR Signatures from External Sources – reflection of earth-shine (in 8-12 μm), sunshine (in 2–3 μm followed by 3-5 μm), & sky-shine (in 8-12 μm);
- Role of Atmosphere – attenuation of IR-signature by intervening atmosphere & atmospheric background radiance;
- Relation between IR-Signature and Aircraft / Helicopter Susceptibility – lock-on envelope & lethal envelope for air-to-air combat in horizontal plane;
- IR-Signature Suppression (& its Penalties) – optical blocking, cooling, emissivity optimization;
- IR Countermeasures (IRCM) for point IR-detection – decoys / flares;
- IRC<sup>2</sup>M – imaging IR-detectors.

## WHO MAY BENEFIT

Target Audience: Indian Army, Indian Navy, Indian Air Force, Indian Coast Guard, DRDO, ADA, HAL, Rolls-Royce, GE, Airbus, Boeing, Honeywell, & all other organizations, establishments, & companies working on Stealth related problems.

Format of the Course: The course is intended to educate the target audience on the basic aspects & details of Aircraft & Helicopter Stealth Technology. The course will include several fundamental & specialized lectures, each will be followed by ample opportunity for Q&A also among the participants. This will enable cross-flow of knowhow between academicians, service officers, & defense scientists, which is expected to synergistically evolve in to a unique learning experience.

## Skills to be Developed:

- Understanding of basic & probabilistic aspects of modern technical warfare
- Clarity on different aspects of aircraft / helicopter observabilities & their reduction

## VENUE FOR CLASSES

Lectures will be in the Seminar Hall, Jal-Vihar Main Guest House, IIT Bombay.

## FACULTY

The faculty instructors in this course include Prof. Shripad P. Mahulikar (course coordinator), Prof. G.R. Shevare, Prof. N. Ananthkrishnan, Prof. Ramnath P.R.C. Aiyar, Prof. Avijit Chatterjee, Prof. P.J. Guruprasad.

## COURSE FEES

Per day per participant = Rs. 5,200.00 + 18% taxes (= Rs. 6136.00).

This CEP course is available in the following two modules#:

### #Module-1 (1st 3-days) = Introduction & Basics

*Following will not be available in Module-1:* RCS computations for realistic geometries - issues & challenges, CAD of Radar Absorbing Materials, Solid Angle Estimation for IR-Signatures, IR-Suppression without Active Cooling, Guided Tutorials on IR-Radiation.

†Fee = Rs. 18,408.00 (= 3 × Rs. 6136.00)

### #Module-2 (all 5-days) = Module1 + Additional Details

†Fee = Rs. 30,680.00 (= 5 × Rs. 6136.00)

The above fee† does not include accommodation charges. On-campus guest-house accommodation currently cannot be guaranteed; hence, participants are encouraged to make their own arrangements, e.g. in other Government Guest-houses.

The fee should accompany the registration form as Demand Draft in favor of “Registrar IIT Bombay” & payable at Mumbai.

[Click here for Online Payment.](#)

## IMPORTANT DATES

**Deadline for submitting Application: Oct 25<sup>th</sup>, 2017**

**Notification of Acceptance: Oct 30<sup>th</sup>, 2017**

**Course Dates: November 10 – 14, 2017**

Participants will be awarded ‘CEP Course Completion Certificate’.

**Completed registration forms should be sent at the following address:**

CEP Office, CE & QIP,  
Attn. CEP Course: “Aircraft Stealth Technology”  
2<sup>nd</sup> Floor, Main Building  
Indian Institute of Technology Bombay  
Powai, Mumbai 400 076  
Phone: (022) 25767006, 25726199  
Fax: (022) 25726199



CEP Short Term Course on

# Aircraft Stealth Technology

**November 10-14, 2017**

Course Coordinator

**Prof. Shripad P. Mahulikar**  
**Department of Aerospace Engineering**

Office of  
Continuing Education & Quality Improvement Programmes

**Indian Institute of Technology Bombay**  
**Powai, Mumbai – 400076**

**REGISTRATION FORM**

5-days CEP Course on

**Aircraft Stealth Technology**

**November 10-14, 2017**

NAME (BLOCK LETTERS): \_\_\_\_\_

\_\_\_\_\_ Gender: M / F

DESIGNATION: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_

MAILING ADDRESS: \_\_\_\_\_

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TELEPHONE: \_\_\_\_\_ (O) \_\_\_\_\_ (R)

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FAX: \_\_\_\_\_ MOBILE: \_\_\_\_\_

EMAIL : \_\_\_\_\_

HIGHEST EDUCATIONAL QUALIFICATION: \_\_\_\_\_

SELECT COURSE #MODULE BY ENCIRCLING: **MODULE-1 / MODULE-2**

BANK DRAFT DETAILS: No. \_\_\_\_\_

AMOUNT = RS. \_\_\_\_\_

NAME OF BANK = \_\_\_\_\_

Date: \_\_\_\_\_ Signature of Applicant

(PHOTOCOPY ADDITIONAL COPIES OF THIS FORM, IF NEEDED)

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