National Test Pilot School

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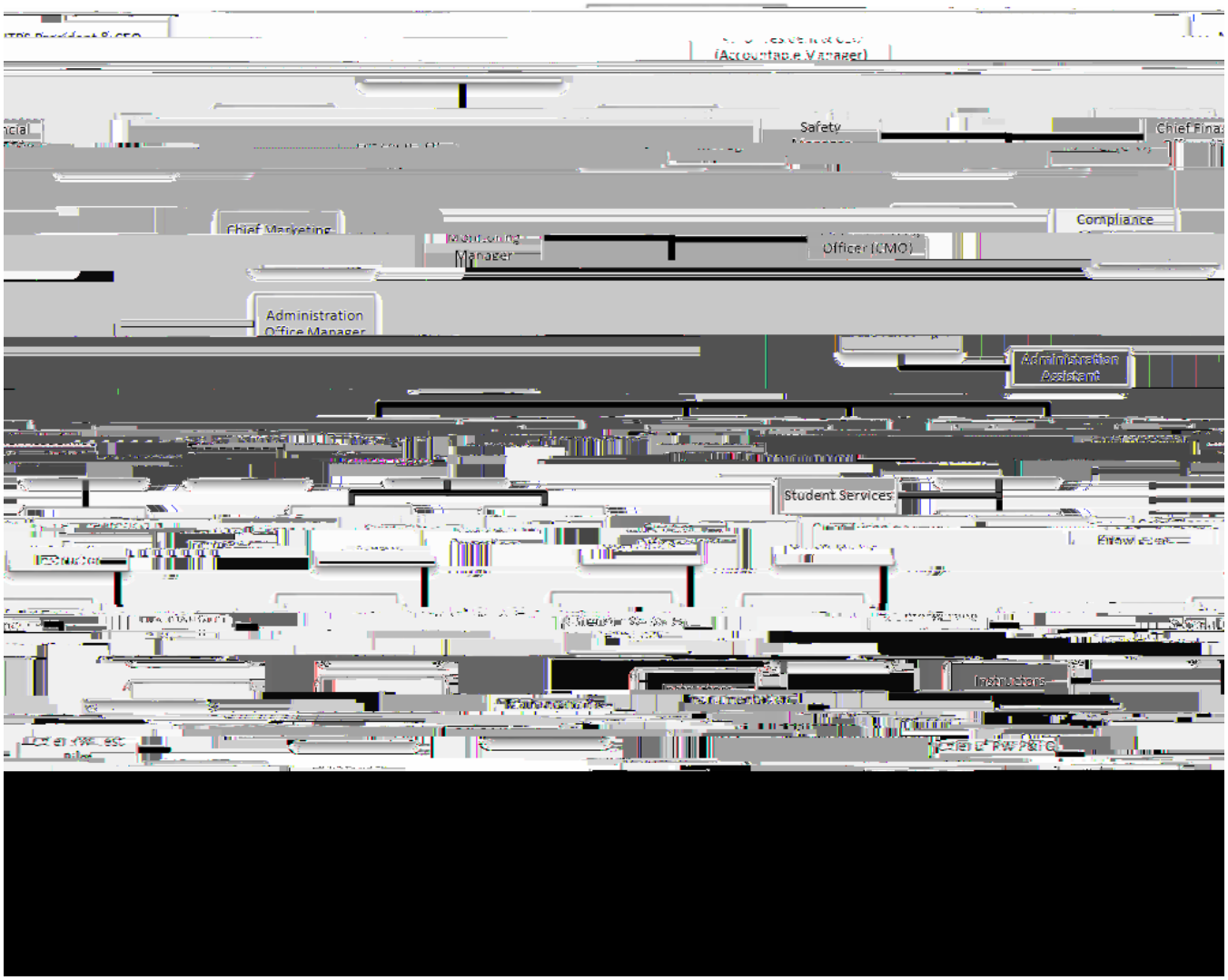
The National Test Pilot School

Welcome to the National Test Pilot School (NTPS). Flight Test is a demanding and exacting field, and the preparation

Organizational Structure

NTPS operates with a matrix structure where faculty and staff report to the Chief Operations Officer for operational issues (e.g. scheduling) and to the Chief Academic Officer/Head of Training for academic related matters (e.g. curriculum). Students should contact the relevant Chiefs of Academics for questions relating to specific coursework.



are not subject to the same rules of civil or criminal proceedings. Because some violations of these standards are also violations of law, students may be accountable to both the legal system and NTPS.

Language Proficiency

English is the recognized language of the International Civil Aviation Organization (ICAO) and is the only language that is used at NTPS. NTPS expects all incoming students to meet the ICAO requirements for speaking, reading, and understanding the English language.

All applicants whose native language is not English, or who were educated at schools where English is not the language of instruction in all disciplines, must submit evidence of English language proficiency. Evidence consists of an official test report for the Test of English as a Foreign Language (TOEFL) submitted directly to NTPS from the testing agency.

The minimum requirement on the TOEFL internet based exam is 70 for a pilot and 60 for a FTE. The results of other English Language proficiency will be considered on a case by case basis and at the submitting student and/or organization’s own risk.

Facilities and Equipment

Producing world-class Flight Test graduates requires world-class facilities. All class sessions are held at the NTPS campus located in building #72 at 1030 Flight Line, Mojave, CA at the Mojave Air and Space Port, a Southern California airport established to accommodate the specialized needs of flight test activities. Mojave has unique facilities, airspace and climate.

Cessna 182 Skylane, Flight test techniques training, Garmin 1000 cockpit.

Cirrus SR22 (3), Single engine, piston propeller, Sidestick controls for pitch and roll, Emergency Airframe Parachute System, Dual Garmin 430 navigation systems (1 AC), Large multifunction display (Avidyne FlightMax) (1 AC) Garmin 1000 Avionics (2 AC).

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Laboratories, Systems and Training Aids

Because NTPS provides a high quality-testing environment, various aircraft systems such as radar, electronic displays, FLIR and threat and warning systems are frequently provided to NTPS by their manufacturers for student evaluation and training. Access to resources can be requested by the student.

NTPS provides its students with access to the latest in equipment needed to train them for the high-tech world of modern Flight Test. Here are some brief highlights of this equipment:

Simulators: NTPS owns a number of flight and systems simulators that allow students to explore various conditions and environments that would otherwise be too expensive or dangerous to experience in a real aircraft. Included is a Variable Stability Simulator which can mimic the real-world characteristics of an experimental aircraft. NTPS also has contractual arrangements for students to visit other organizations flight simulator centers for additional training and experience.

Camber Radar: NTPS has contracted with Camber Corp to provide a RADAR simulation program. The RADAR Simulation is a complex, real-world energy level model of the interaction of the emitted radio transmission and the simulated environment. The component based design provides ease of use and allows a user familiar with RADAR systems to quickly prototype complex RADAR systems and modes which include ground, weather,

NVG Lab: The ability to see in the dark is the focus of much cutting-edge

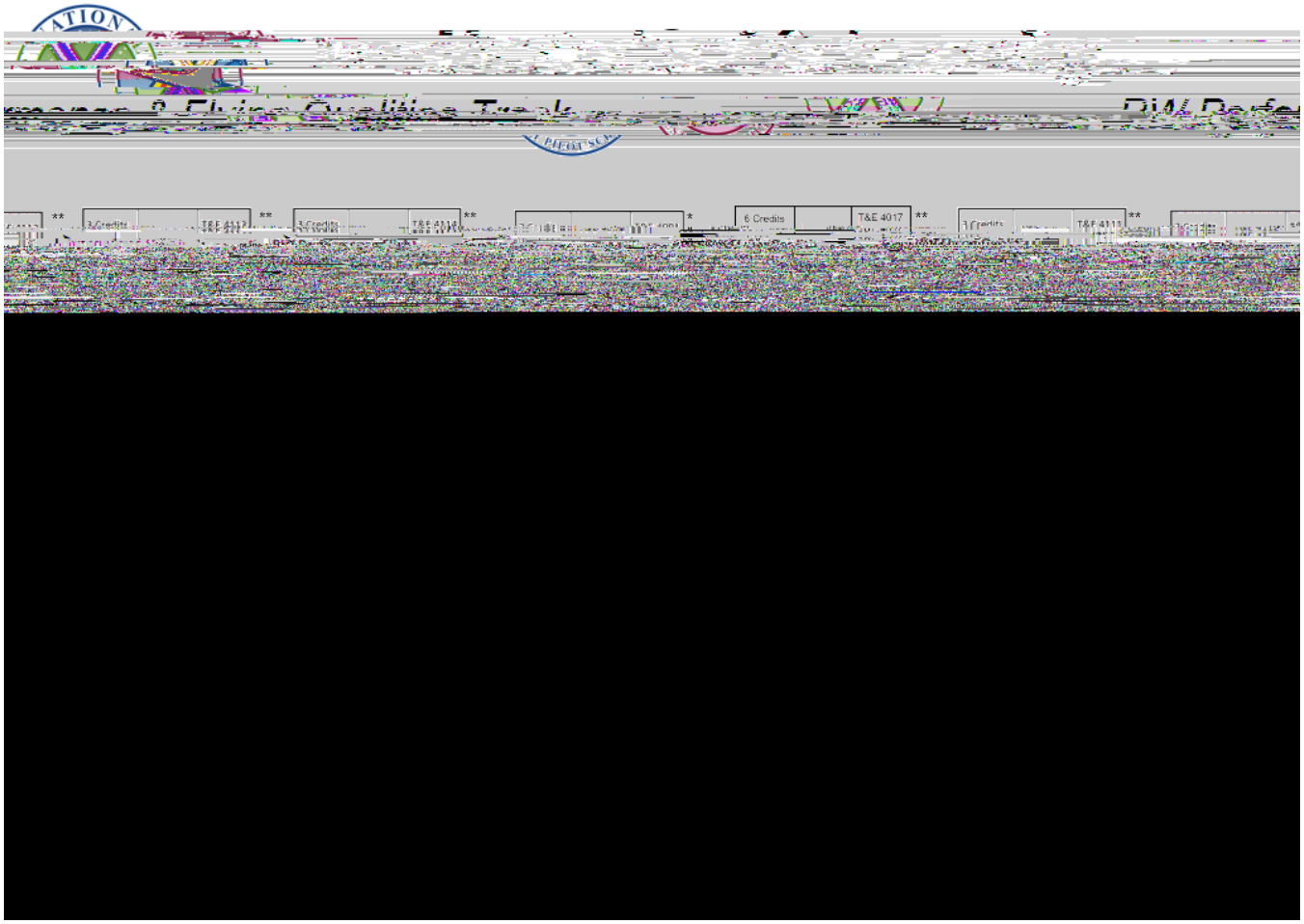
Programs and Curricula

The National Test Pilot School (NTPS) offers Master of Science degrees in Flight Test Engineering (MS FTE) and Flight Test and Evaluation (MS FT&E). The two degree programs curricula are identical, only the prerequisites differ.

: Rotary Wing Performance and Flying Qualities

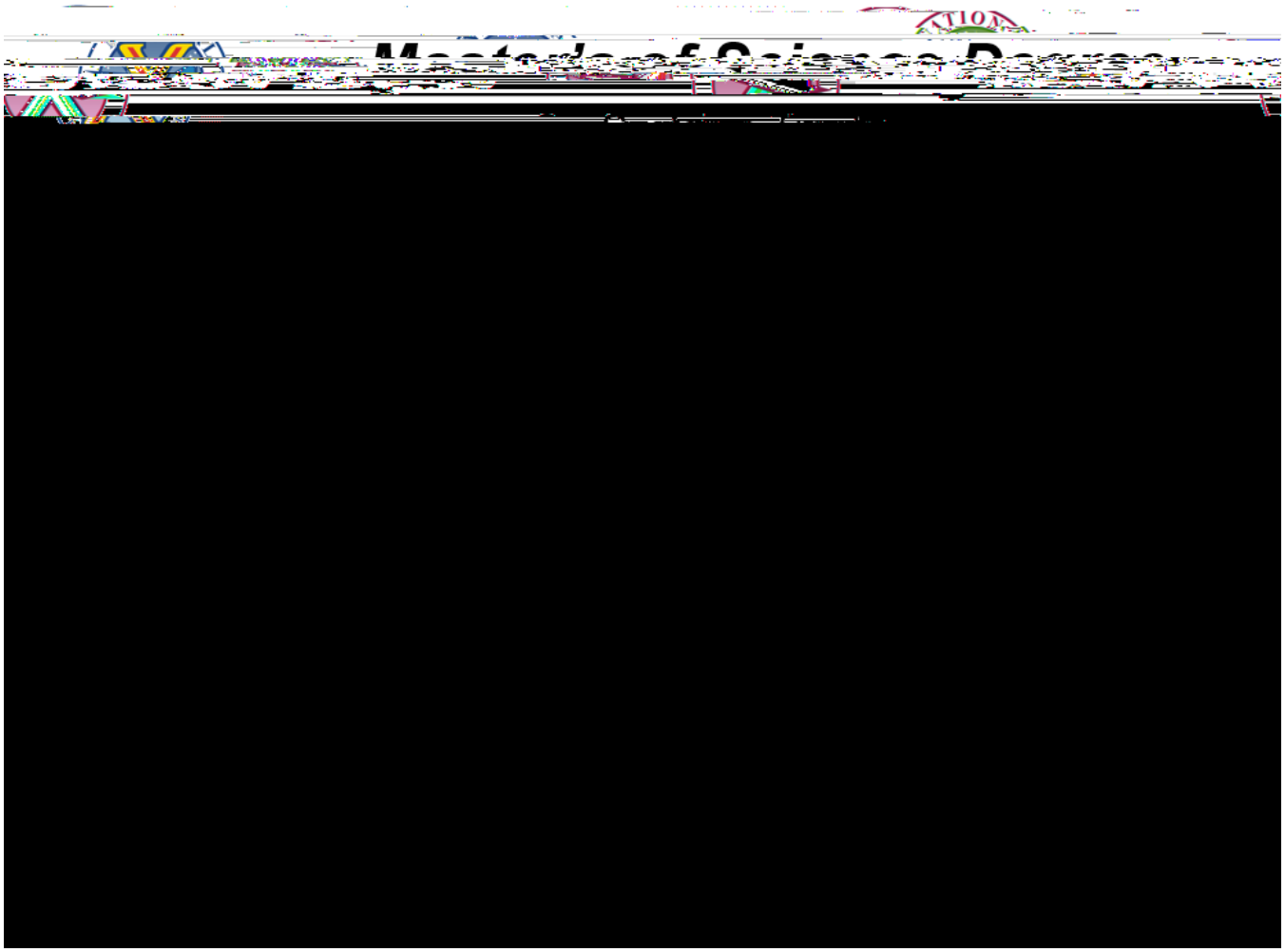
Students enrolled in the Rotary Wing Performance and Flying Qualities (RW P&FQ) track must take all three core modules; the RW P&FQ sequence T&E 4017, 4111, 4112, 4113, 4114, 4105, 4116; and 15 Flight Test Engineering elective credits. Track description is shown in the Master's Degree Track Rotary Wing Performance and Flying Qualities table.

: Rotary Wing Performance and Flying Qualities	***Quarter Credits***	
	Academics	*Practical*
Core Modules		
T&E 4001 – Fundamentals of Flight Test	3	
T&E 4002 – Test Management and Operational Test and Evaluation	3	
T&E 4003– Capstone Project		3


6 Credits
T&E 4017
**

Systems

Students enrolled in the Systems track must take all three core modules; the Systems sequence T&E 4008, 4201, 4202, 4203; and 24 Flight Test Engineering elective

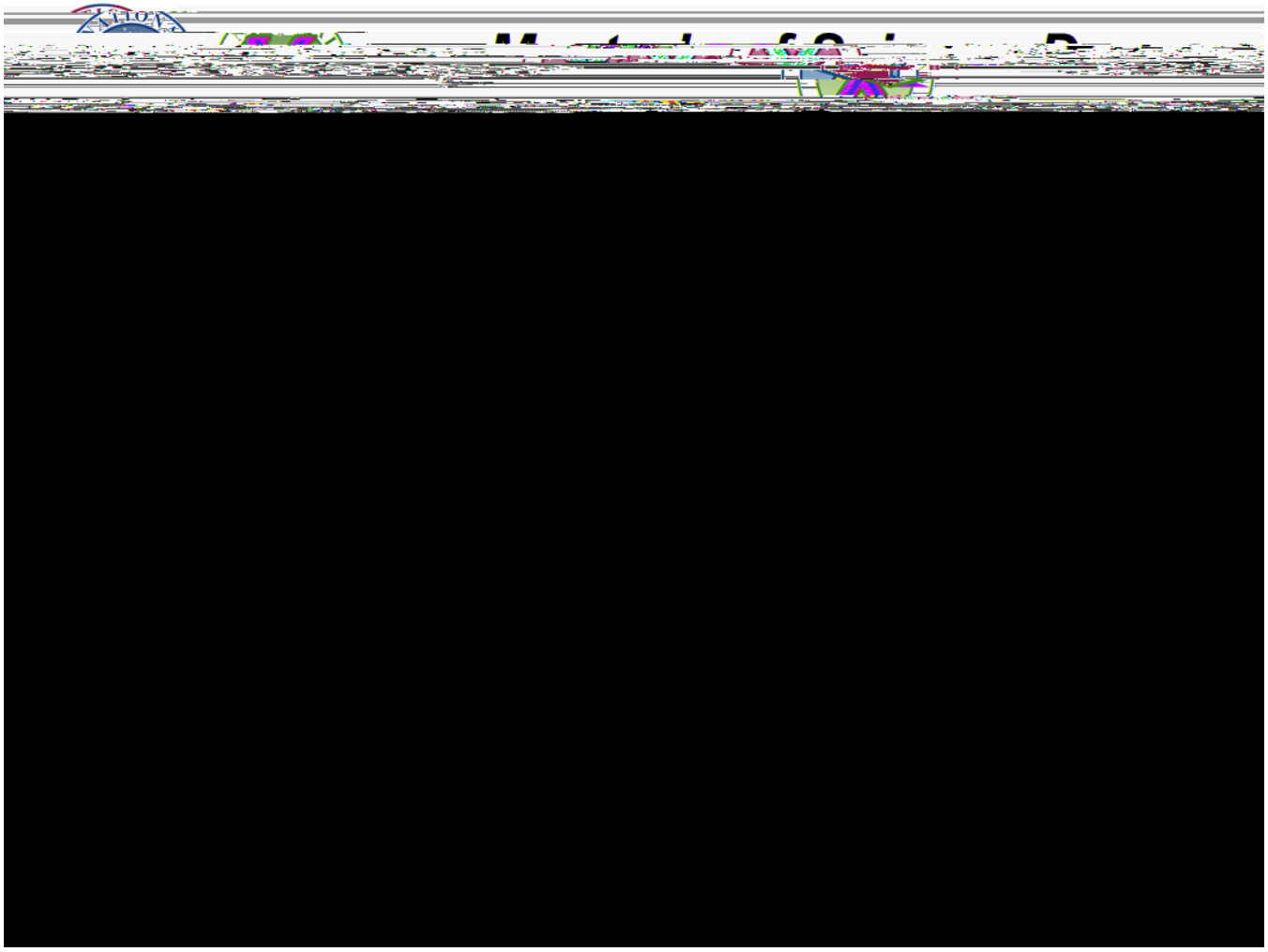


Professional Courses

Test Pilot / Flight Test Engineer Professional Course

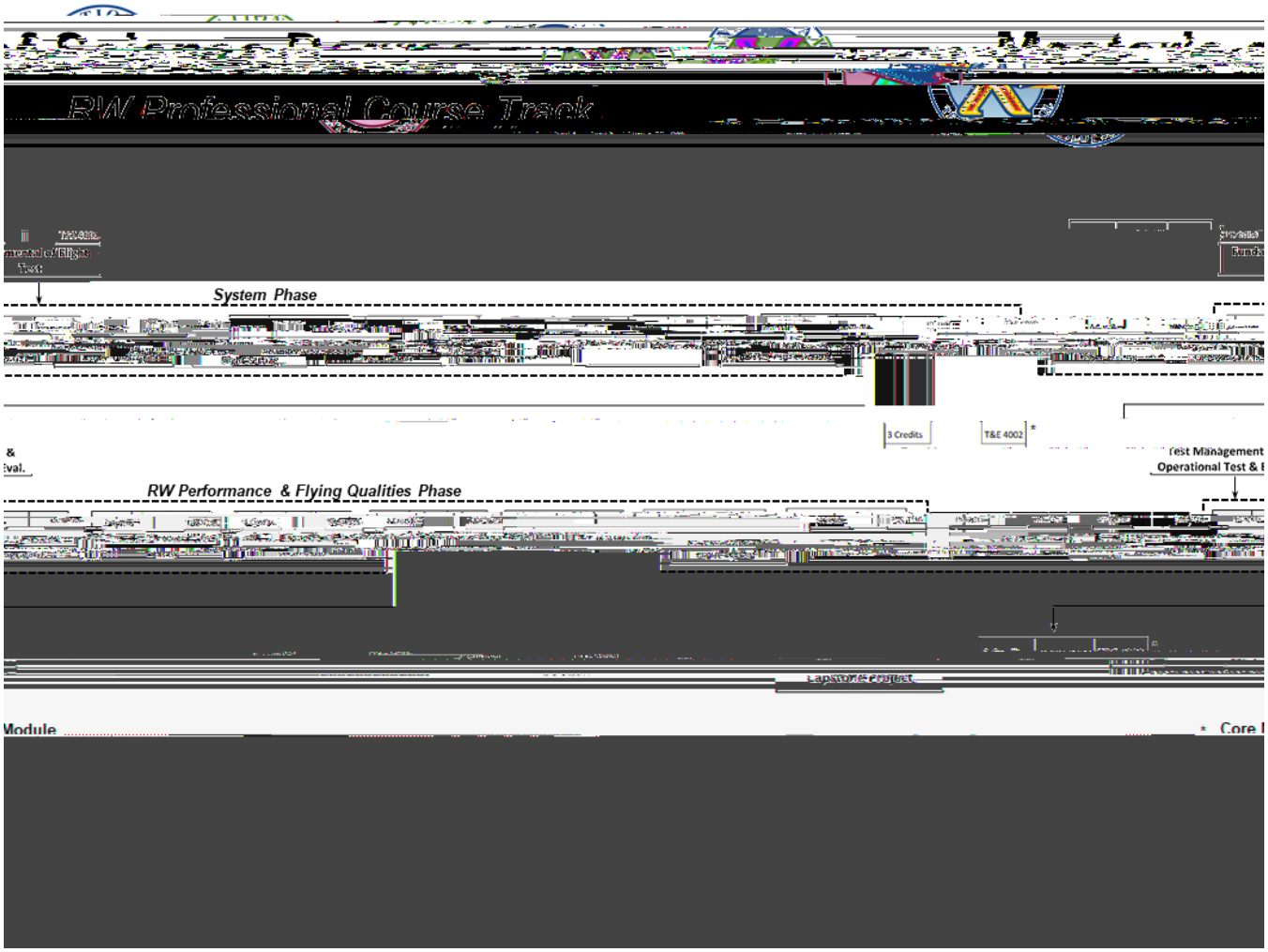
The Professional Course is the ultimate in-flight test education. Graduates of this 50 week course are prepared to perform envelope expansion, civil certification, and military suitability flights meeting FAR/EASA/Military certification or military specifications. This course is designed to equip experienced pilots and engineers with the knowledge and practical experience to certify new or modified aircraft to stringent FAR/EASA/Military certification standards or to recommend the aircraft for

Fixed Wing Professional Course Track



Rotary Wing Professional Course Track

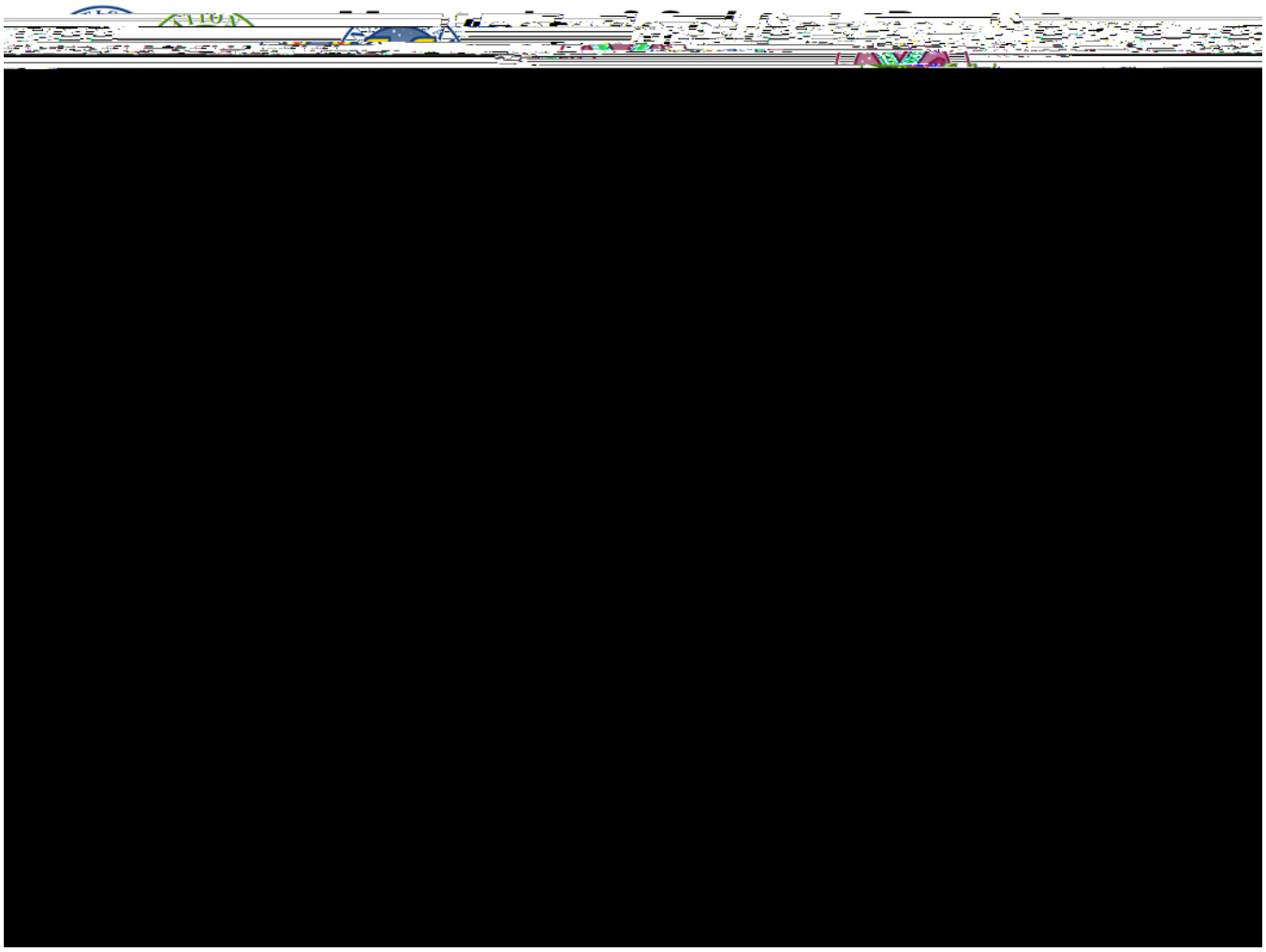
Students enrolled in the Rotary Wing Professional Course track take all three core modules, 34 credits of P&FQ Flight Testing, and 38 credits of Systems Flight Testing. The modules consist of both theory and practical credits. Track description is shown in the Rotary Wing Professional Course Track table. This track exceeds the Master's graduation requirements.


RW Professional Course Track
System Phase
3 Credits
T&E 4002
RW Performance & Flying Qualities Phase

Performance and Flying Qualities Professional Course

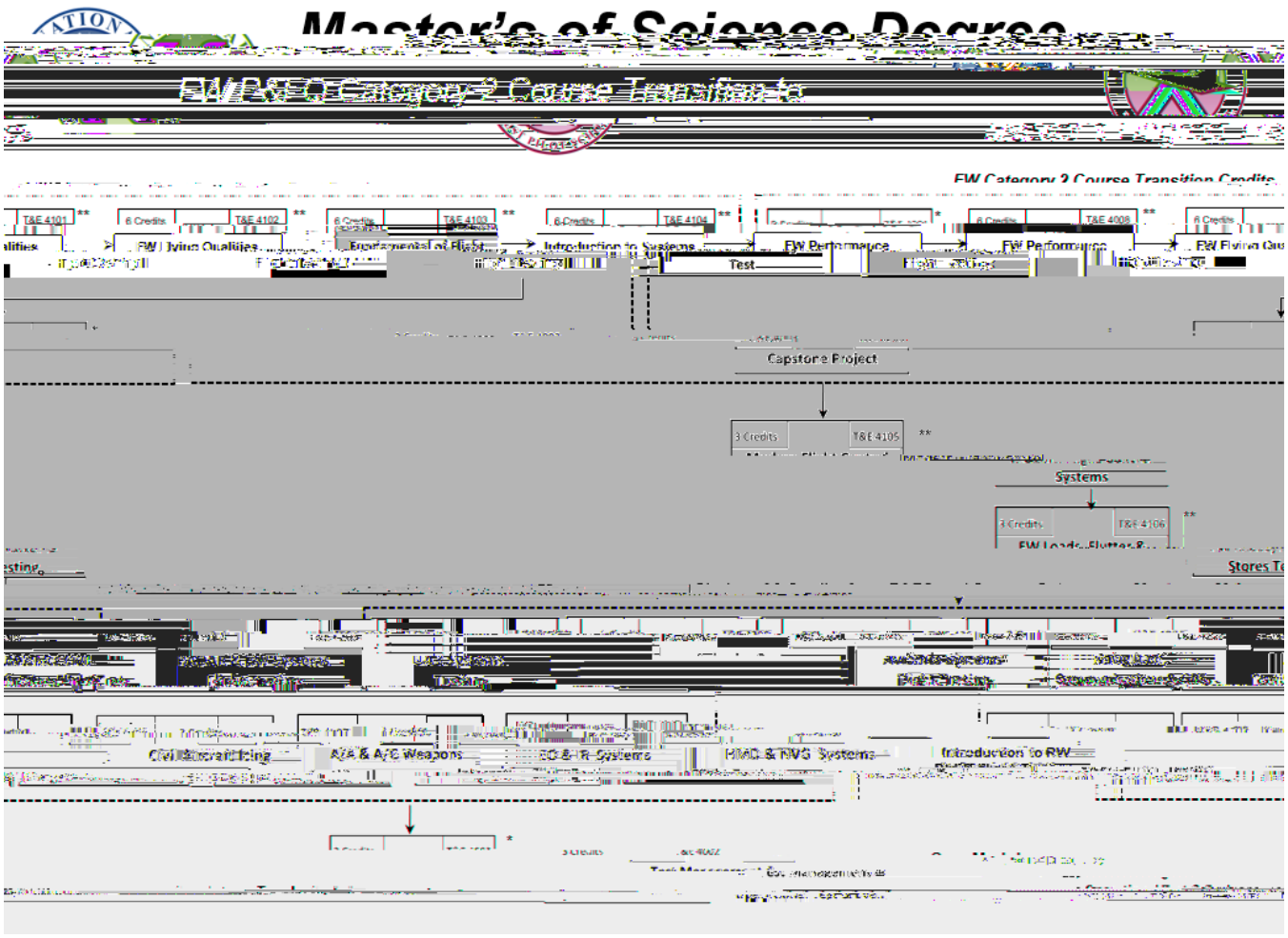
Graduates of this 26 week course are prepared to perform Performance and flying qualities (P&FQ) envelope expansion, civil certification, and military suitability flights meeting FAR/EASA/Military certification or specifications. This course is designed to equip experienced pilots and engineers with the knowledge and practical experience to certify new or modified aircraft to stringent FAR/EASA/Military P&FQ certification standards or to recommend the aircraft for specific military missions. This is not a basic flight training

NTPS Catalog



NTPS Catalog

NTPS Catalog


Master's of Science Degree
FW Category 2 Course Transition to
FW Category 2 Course Transition Credits
T&E 4101
6 Credits
T&E 4102
6 Credits
T&E 4103
6 Credits
T&E 4104
T&E 4008
6 Credits
Introduction to Systems
FW Performance
FW Performance
Test
Capstone Project
3 Credits
T&E 4105
Systems
3 Credits
T&E 4106
Stores To
Introduction to RW

Capstone Project
3 Credits
T&E 4116
Choice of 3 Credits from P&EO and System Courses Electives
6 Credits
T&E 4007
Core Module

aircraft acceptance flight test to include crew resource management exercise is performed. A complete takeoff speed development and stability and control exercise for large jet aircraft is performed in the Simulator. At the completion of this course the student will have a basic knowledge of the Type Certificate Requirements / Process, and the role maintenance and acceptance flight test plays in ensuring the aircraft performance, flying qualities, and systems meet the critical Type Certificate Requirements.

Subjects Covered

Subsonic Aerodynamics
Certification Process/Documentation
Takeoff & Land/Takeoff Speed Development
Integrated Avionics
Introduction to Stability and Control (S&C)
Aircraft Subsystems
Aircraft Design/Modification Effects on S&C
Mach Effects on S&C
Introduction to Variable Stability Simulation
Upset Recovery Theory
Transonic Aerodynamics
Acceptance Test Checklist
Flight Management System
Flight Controls
Crew Resource Management
Warning Systems
Ground Acceptance Inspection
PIO Theory
Stalls and High Angle of Attack
Asymmetric Flight
Introduction to Acceptance Testing
Navigation Systems
Aeroelasticity and Flutter Hazards
Safety In Flight Test

HMD & NVG Testing

This course is designed to provide technical and human factors information regarding Helmet Mounted Displays (HMDs), Night Vision Imaging System (NVIS) 0 612 792 reW* 99.504 558.94 Tm0 g0 G[ )]TJETQqMCID 50y anact BMC EMC /Span <</MCID

Academic Modules

The academic modules make up the core of the Master's Degree program and professional courses. However, academic modules can be taken on their own as short courses provided that prerequisite modules have been completed and entrance requirements have been met.

T&E 4001 Fundamentals of Flight Test

This two week (masters) / three week (TP/FTE Course) course is typically offered twice a year and consists of academic lecture, laboratory exercises, and airborne flight instruction offered daily on a Monday through Friday schedule. This is a foundational course for the Master's Degrees and the Test Pilot and Flight Test Engineer courses that covers the fundamental subjects of flight test. The role of the test pilot and flight test engineer is described along with an explanation of the different types of flight test including R&D, DT&E, and OT&E. Other key subjects covered include: Report Writing, Human Factors and Cockpit Evaluation, Test Planning, Risk Management, Safety in Flight Test, Data Analysis, Certification Standards, and Math/Physics Review.

Pre-requisites:

None.

Anticipated Course Learning Outcomes*:*

a. Be familiar with:
   Computer-based data analysis tools.
   The techniques used to conduct a cockpit evaluation.

b. Understand:
   The purpose of flight test and evaluation and am familiar with the T&E process.
   The roles and responsibiliti( )Ca8re lighpose of teht testvaluation.

ear&wid Othbaguose ibf valuation.

Climb performance theory and test methods.
Turn performance theory and test methods.
Stall theory and test methods.
How to test and evaluate cruise performance of a jet aircraft.

T&E 4103 Flying Qualities Flight Testing I

This course is offered once per year on-campus and once per year distance learning. The course is designed to provide an intensive overview of the methods used to make static stability determinations of aircraft. Subjects include the theory, regulatory requirements and flight test techniques involved in determining the longitudinal, lateral-directional, maneuvering, and flight path stability of single and multi-engine aircraft. Engine out testing of multi-engine aircraft is included along with a brief explanation of mechanical flight control systems and Mach effects on stability and control.

c. Know

Flight test techniques used to quantitatively and qualitatively determine aircraft dynamics
Spin theory and flight test techniques
Closed-loop handling qualities testing and techniques.
How to determine the stall characteristics of an aircraft.

T&E 4105 Modern Flight Controls

This course is offered once per year onosed

T&E 4106 FW Loads, Flutter & Stores Testing

This course is offered once per year on-campus. The course is designed to provide an extensive review of vehicle structures, loads and flutter/vibration testing takes the student from basic properties of materials through advanced instrumentation methods for determining vibrations/flutter regions and divergence. Industry standards for determining loads limits and vibrations/freedom from flutter are addressed as well as possible ways for obtaining required data in a limited amount of flight time. A study of the instrumentation installation on an NTPS aircraft enhances the students' knowledge of the correct test methods for in-flight loads determination. Stores clearance may be considered an extension of aircraft loads and flutter/vibrations testing. Unique stores load and flutter/vibrations issues are examined as well as theory and methods for clearing stores for external carriage and separation/launch.

Pre-requisites:

T&E 4001, 41W8aini&-5(t tim)1 0 0 1 67.a9(4-5(c)10(h)-5(.)]TJETQq0.00000912 0 612 792 reW* nBT/F2 9.9658.411 0 0 1 1(

Icing test principles and the reasons for dry air, simulated ice accretions and natural icing tests.
The requirement for measuring icing cloud parameters.

T&E 4111 RW Performance Flight Testing I

This course is offered once per year on-campus. The course is designed to provide an intensive overview of the methods used

b. Understand
Transonic aerodynamics principles.
Autorotation descent performance.

c. Know
Climb and descent performance theory and test methods.
Take-off/landing performance theory and test methods.
Height-velocity theory and test methods.
Level flight performance theory and test methods.
How to predict significant airspeeds from performance data.
The effects of engine failure.

T&E 4113 RW Flying Qualities Flight Testing I

This course is offered once per year on-campus. This course is designed to provide an intensive overview of the methods used to determine static stability of helicopters. Subjects include the theory, regulatory requirements and flight test techniques involved in determining the longitudinal, maneuvering and lateral-directional, stability of helicopters. Mechanical flight control systems, low airspeed stability and control, and closed loop handling qualities are also are taught.

Pre-requisites:
T&E 4001, 4111 & 4112.

Anticipated Course Learning Outcomes

a. Understand
Flight controls mechanical characteristics.
Fundamentals of helicopter equations of motion.
Helicopter trim systems.
Closed-loop handling qualities.
The applicable Mil and CFR/CS regulatory requirements.
Rotor system characteristics.

b. Know
How to determine the critical azimuth in the low airspeed envelope.
How to determine the longitudinal static stability of a helicopter using the appropriate flight test techniques.
How to determine the maneuvering stability of a helicopter using the appropriate flight test techniques.
How to determine the lateral-directional static stability of a helicopter using the appropriate flight test techniques

T&E 4114 RW Flying Qualities Flight Testing II

This course is offered once per year on-campus. The course is designed to provide an intensive overview of the methods used to make dynamic stability determinations of helicopters. Subjects include rotary wing equations of motion, dynamics requirements and flight test techniques. I5c73(eq)-7(u)-5(ir)-2(em)-6(e)10(n)-5(ts)41 reW* nBTElicopter using the approbreW* nTJ3(h)-5(

NT(rw)-2(S Ca)-7(t)-3(a)-5(lo)-4(g)-5( )-2( )]TJE/Q0.00000912 0 612 792 reW*nBT/F1 9.96 Tf1 0 0 1 5120.38746.64 Tm/ g/ G[N)]TJE

AS 15531. Data acquisition, correlation, merging and analysis with an inclination towards true versus predicted performance shall be explained.

Pre-requisites:

T&E 4001.

Anticipated Course Learning Outcomes

a. Be familiar with:
   Avionic systems data bus specifications and regulations
   Electrical, electromagnetics and logic circuits as they relate to Avionics flight testing
   Cyber security impacts on avionics system flight testing

b. Understand:
   Other types of Data Busses
   The unique problems associated with Avionics Systems Flight Testing
   Software test and configuration management principles

c. Know:
   Workload evaluation test techniques for Avionic systems.
   Workload data collection and data analysis procedures
   MIL-STD-1553B data bus architectures

T&E 4202 Communication, Navigation and GPS Flight Testing

This course is offered once per year on-campus and once per year distance learning. The course is designed to provide an extensive examination of Avionic communications and navigation systems, their modes of operation, and procedures for evaluating and testing the equipment are formulated. Electromagnetic interference and compatibility testing is discussed. Voice and datalink communication testing is discussed. Ground based radio navigation aids and GNSS flight testing are discussed. Inertial navigation systems and the testing of integrated navigation systems are explained.

Pre-requisites:

T&E 4001 (T&E 4201 may be taken concurrently) or permission of instructor.

The Anticipated Student Academic Outcomes

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T&E 4203 14 CFR Part 23/25/27/29 Avionics Certification Flight Testing

This course is offered once per year on-campus and once per year distance learning. The course is designed to provide a primary emphasis on the evaluation of civil avionics systems and the means of showing compliance with the applicable Civil Regulations i.e., Code of Federal Regulations Title 14 and Regulations (EU) 2018/1139 of the European Parliament and of the Council. Since many of the civilian requirements are now applicable in military aircraft, this module is especially important for those individuals involved with showing military compliance with these civil requirements. The importance of Flight Management System evaluation in today's automated cockpits will be emphasized. The student will be instructed in the evaluation and test of proximity warning systems such as Traffic Alert and Collision Avoidance (TCAS) and Terrain Awareness and Warning Systems (TAWS). Flight Guidance Systems, Automated Landing Systems, Weather RADAR, Reduced Vertical Separation Minima and civil certification of positioning and navigation systems will be examined. A history of the Civil certification regulations and other documentation, as well as the Human Factors impact to certifications, will be addressed. Controls and Displays implementation, and Software considerations in the certification process, as well as considerations for complex systems are also identified.

Pre-requisites:

T&E 4001 & 4201.

The Anticipated Student Academic Outcomes

a. Be familiar with:
   - The history and overview of Civil certification requirements
   - Civil certification requirements for software
   - Civil certification requirements for Avionic systems

b. Understand:
   - Civil certification requirements for crew station controls and displays
   - Human Factor effects on Civil certification requirements for Avionic systems
   - Civil certification requirements for Flight Management Systems and Flight Guidance Systems
   - Civil certification requirements for landing systems

c. Know:
   - The Civil certification process for issuing design, production and airworthiness approvals
   - The test and evaluation process of avionic systems to show compliance with Civil regulations

T&E 4204 Flight Test of RADAR and Electronic Warfare Systems

This course is offered once per year on campus. The course is designed to assist the student in the development and test of airborne RADAR systems. The basic concept and modes of operation as well as RADAR fundamentals are explained in detail. The student is afforded hands-on operation of the Camber Corporation RADAR toolkit. This simulation is a complex, real-world, energy level model of the emitted radio transmissions and incorporates a digital terrain database to show the student effects of changing RADAR parameters on RADAR performance. Lectures cover basic RADAR theory as well as the multi-mode operation of today's airborne applications. The student will learn the most correct and efficient methods of demonstrating specification compliance and performance of airborne RADARs.

Pre-requisites:

T&E 4001 & 4201.

Anticipated Course Learning Outcomes

a. Be familiar with:
   - EW Introduction and Integrated Air Defense systems (IADS)
   - Electronic Attack

of Stores Management Systems (SMS) and Hazard Analysis considerations are covered. Error budgeting and analysis are key elements in undertaking ballistics evaluations.

Pre-requisites:

T&E 4001 & 4201.

Anticipated Course Learning Outcomes

a. Be familiar with:
   - MIL-STD-1760D/E
   - Weapon to aircraft interface
   - Weapon templates and safety footprints
   - Air drop testing

b. Understand:
   - Stores Management Systems
   - Error budgets
   - Weapons accuracy analysis

c. Know:
   - Air-to-air weapons evaluations techniques and considerations
   - Air-to-ground weapons evaluations techniques and considerations
   - Weapon evaluations hazard analysis considerations

T&E 4207 Electro-Optics and Infrared Systems Flight Testing

This course is offered once per year on campus. The course is designed to provide a review basic Electro-optical (ultraviolet, visible and infrared) theory and then teach practical applica]TJETQ/77.31 Tm0 g0 G[ )]9n4.93 388.0 g0 G≥67 49.03 0 G[-)]TJETQq0.0000

Veterans and Military Benefits

The National Test Pilot School (NTPS) Office of the Student Services serves as the liaison between NTPS, its students, and the various federal, state, and local agencies concerned with Veterans Affairs (VA) education benefits and Department of Defense (DoD) tuition assistance.

NTPS has made a good faith effort to comply with the Principles of Excellence established by Executive Order 13607. NTPS participates in the Department of Defense Voluntary Education Partnership program so that eligible active duty service members are able to obtain Tuition Assistance from their military branch as administered by the Department of Defense. The VA Certifying OfficerW* nBTs.10reW* n9ith