Gulfstream Flight Test Safety Management System

Evaluation Tool Guidance

Flight test presents unique hazards and elevated risk levels during the development and certification of aircraft and new systems. These characteristics distinguish flight testing from typical operational or line flying and thus necessitate a tailored and relevant Safety Management System (SMS). To sufficiently assess the SMS being applied to its flight test practices and procedures, Gulfstream Aerospace Corporation customized a pre-existing audit tool that accommodates the uniqueness of flight test processes but also aligns closely with accepted industry practice.

Utilizing the Safety Management System Evaluation Tool published by the Safety Management International Collaboration Group (SMICG)[1], Gulfstream sought to develop an audit protocol to enable a comprehensive and standardized assessment of the SMS being applied to its Flight Test operations. Gulfstream's adaption of the SMICG Evaluation Tool to a flight test application was permitted in the terms of the SMICG preamble, "… to allow any regulator to use and adapt the tool to serve its own purposes." All users are strongly encouraged to reference the preamble to the source document for its guidance on making an initial assessment, ongoing surveillance and application of the tool. The definitions utilized in this audit protocol mirror those in the original document, though interpretation and understanding of these terms remains unique to the organization implementing the tool.

The implantation of an SMS in itself does not beget a positive safety culture nor improved safety performance. That is a leadership challenge that requires a commitment from the highest levels of the organization. Gulfstream provides no guarantee or assurance on safety performance with the use of this auditing protocol.

For questions regarding the audit protocol as it relates to assessing an SMS in a flight test organization, please contact the Gulfstream Aviation Safety Office.

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[1] Safety Management International Collaboration Group, 2012. Safety Management System Evaluation Tool, version 1.0. Accessed November 2014, http://www.skybrary.aero/bookshelf/books/1774.pdf

GAC Flight Test Safety Management System
Audit Protocol

1. SAFETY POLICY AND OBJECTIVES

1.1 MANAGEMENT COMMITMENT AND RESPONSIBILITY

The organization shall define its Flight Test organizational safety policy which should be in accordance with recognized SMS framework and standards, and which shall be signed by the Accountable Executive of the organization. The safety policy shall reflect organizational commitments regarding safety, about the provision of the necessary human and financial resources for its implementation and be communicated, with visible endorsement, throughout the organization. The safety policy shall include the safety reporting procedures and affirm the tenants of just culture. The safety policy shall be periodically reviewed to ensure its remains relevant and appropriate to the organization.

EFFECTIVENESS is achieved when the organization has defined its safety policy that clearly states its intentions, safety objectives and philosophies and there is visible evidence of safety leadership and management 'walking the talk' and demonstrating by example.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
1.1.1	There is a Flight Test safety policy that stands-alone or supplements existing corporate safety policies and includes a mandate to participate in the safety management system.						
1.1.2	The Flight Test organization has based its safety management system on international and national accepted standards (i.e., ICAO Annex 19 and FAA AC 120-92 Series).						
1.1.3	Flight Test Leadership promotes and demonstrates their commitment to the safety policy through active and visible participation in the safety management system.						
1.1.4	The safety policy is communicated to all personnel with the intent that they are made aware of their individual contributions and obligations with regard to safety and the effectiveness of the SMS.						
1.1.5	The Flight Test safety policy highlights the uniqueness of flight test and the importance of employing standards and best practices while underscoring safety as an individual and organizational responsibility.						

Indicators of Conformance and Performance *(continued)*	P	S	O	E	How it is achieved	Verification
1.1.6	The safety policy actively encourages safety reporting and clearly indicates which types of behaviors are unacceptable and includes the circumstances under which disciplinary action would not apply.						
1.1.7	The safety policy states the organization's intentions, management principles and commitment to continuous improvement in safety performance.						
1.1.8	The Flight Test safety policy contains a review cycle to ensure currency, accuracy, and relevancy.						
1.1.9	There is commitment of the Flight Test Leadership to the development and ongoing improvement of the safety management system.						
1.1.10	The Flight Test SMS describes the importance of Just Culture and distinguishes between errors and intentional violations.						
1.1.11	There is a committee and process to review safety reports and stimulate corrective action.						
1.1.12	There is evidence of decision making, actions, and behaviors that reflect a positive safety culture.						

Best Practice Indicators	P	S	O	E	How it is achieved	Verification
1.1.13	Flight Test Leadership reinforces the concept that each individual is a critical enabler of an effective safety system.						
1.1.14	There is one corporate aviation safety policy used throughout the organization and it is implemented at all levels of the organization.						
1.1.15	The safety policy is clearly visible, or available, to all personnel and is included in key documentation and communication media.						
1.1.16	Flight Test's safety policy objectives complement the organization's goals and mission statements.						

Best Practice Indicators *(continued)*		P	S	O	E	How it is achieved	Verification
1.1.17	Flight Test personnel are educated, trained, and familiar with the SMS and embrace the policy and its message.						
1.1.18	Flight Test Leadership demonstrates their commitment to safety and professional excellence by membership in professional affiliations, participation in training and safety conferences, and encouraging employees to do the same.						
1.1.19	Flight Test Leadership has adopted an integrated safety planning process with published and measurable safety targets and objectives.						

1.2   SAFETY ACCOUNTABILITIES

The organization shall identify the Accountable Executive who, irrespective of other functions, shall have ultimate accountability on behalf of the organization for the implementation and maintenance of the SMS. With respect to the safety performance of the SMS, the organization shall identify the safety responsibilities of all members of Flight Test management and personnel, irrespective of other functions. Safety responsibilities shall be documented and communicated throughout the organization, and shall include a definition of the levels of management with authority to make decisions regarding safety risk acceptance.

EFFECTIVENESS is achieved when there are clear lines of safety responsibilities throughout the organization including the person who has ultimate accountability for the Flight Test SMS and its effectiveness to appropriately manage risk.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
1.2.1	An Accountable Executive within Flight Test has been appointed with ultimate accountability for the SMS to ensure it is properly implemented and performing effectively.						
1.2.2	The Flight Test Accountable Executive has control of, or direct input to, the financial and human resources required for the proper implementation of an effective SMS.						

Indicators of Conformance and Performance *(continued)*		P	S	O	E	How it is achieved	Verification
1.2.3	Flight Test Leadership is fully aware of their SMS roles and responsibilities in regard to the safety policy, safety standards, and safety culture of the organization.						
1.2.4	Safety accountabilities, authorities, and responsibilities are defined and documented throughout the Flight Test organization.						
1.2.5	Flight Test personnel at all levels are aware of, and understand, their safety responsibilities regarding all safety management processes, decisions, and actions.						
1.2.6	Safety awareness and participation is shared across the organization and is not just the responsibility of the Safety Manager and their team.						
1.2.7	There are documented management organizational diagrams and/or job descriptions for all personnel.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
1.2.8	Members of the Flight Test organization are afforded opportunities to participate in SMS activities and/or councils and have a sense of ownership for safety improvement.						
1.2.9	There is evidence that safety management system principles have penetrated all levels of the organization and safety is part of everyday values.						
1.2.10	Safety responsibilities throughout the Flight Test organization are clearly documented and individuals understand expectations of their role in the safety system.						
1.2.11	Safety goals and accomplishments are incorporated into personnel performance evaluations and feedback is provided.						

Best Practice Indicators *(continued)*		P	S	O	E	How it is achieved	Verification
1.2.12	There is evidence that Flight Test Leadership recognizes the significance of safety contributions from all levels of the organization and has a mechanism for acknowledging those safety contributions.						

1.3 APPOINTMENT OF KEY PERSONNEL

The Flight Test organization shall identify a Flight Test SMS Manager to be the responsible individual and focal point for the SMS process execution including investigations, corrective actions, and follow-up.

EFFECTIVENESS is achieved when the Flight Test SMS is facilitated by the responsible individual and there is a safety structure of key personnel from the various operational areas of the organization. Flight Test Leaders are actively engaged in the safety management system and are committed to enhancing safety performance.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
1.3.1	A competent person with the requisite SMS and Flight Test knowledge, skills, and experience has been nominated to manage the operation of the Flight Test SMS.						
1.3.2	The person managing the operation of the Flight Test SMS fulfils the required job functions and responsibilities.						
1.3.3	There is a direct reporting line between the Flight Test SMS Manager and the Flight Test Executive.						
1.3.4	The organization prioritizes sufficient resources to manage the SMS including manpower for safety investigations, analysis, auditing, and promotion.						
1.3.5	Personnel in key safety roles are kept current through membership in professional affiliations and by attending educational courses, training, and safety conferences.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
1.3.6	The organization has established structured safety committee(s), appropriate for the size and complexity of the organization, and have a charter with defined objectives.						
1.3.7	The Flight Test safety committee monitors the safety performance of the operations and the effectiveness of the SMS.						
1.3.8	The person responsible for managing and maintaining the Flight Test SMS is given appropriate status in the organization reflecting the importance of the safety role within the organization.						
1.3.9	The Flight Test safety committee includes representatives from all necessary stakeholders and has a means to communicate results to Flight Test and corporate leadership as appropriate.						
1.3.10	The safety committee(s) is/are focused on safety issues and all attendees fully participate.						

1.4 COORDINATION OF EMERGENCY RESPONSE PLANNING

The Flight Test organization shall have a comprehensive emergency response plan that provides for rapid communication and response. The ERP will prompt other emergency response and services both within and outside the Flight Test organization as appropriate.

EFFECTIVENESS is achieved when the organization has an emergency response plan that is appropriate to the organization and is regularly tested and updated including coordination within the Flight Test organization and other parts of the company as appropriate.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
1.4.1	The Flight Test organization has adopted an Emergency Response Plan (ERP) that reflects the size, nature and complexity of the operation and defines the procedures,						

		P	S	O	E	How it is achieved	Verification
	roles, responsibilities, and actions of the various organizations and key personnel.						
1.4.2	Key personnel have reliable notification of a mishap and easy access to the ERP at all times.						
1.4.3	The organization has a process to distribute the ERP procedures and to communicate the content to all personnel.						
1.4.4	The Flight Test ERP is periodically tested for the adequacy of the plan and the results reviewed to improve its effectiveness.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
1.4.5	The Flight Test ERP is integrated with overall company response plans and accommodates the necessity to interface with local crash and rescue response entities.						
1.4.6	The organization has implemented Casualty Assistance Training and Critical Incident Stress Management for its personnel as appropriate.						

1.5 SMS DOCUMENTATION

The Flight Test organization shall develop and maintain SMS documentation describing the safety policy and objectives, the SMS processes and procedures, responsibilities, and the safety performance expectations. The Flight Test organization may incorporate the SMS documentation into its existing organization documentation or may develop and maintain a Safety Management System Manual (SMSM) to communicate its approach to the management of safety throughout the organization.

EFFECTIVENESS is achieved when the Flight Test organization has SMS documentation that describes their approach to the management of safety that is used throughout the organization and is regularly reviewed and updated. The documentation is aligned to recognized standards and meets the safety objectives of the organization.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
1.5.1	There is documentation that describes the safety						

		P	S	O	E	How it is achieved	Verification
	management system and the interrelationships between all of its elements.						
1.5.2	Flight Test SMS documentation is regularly reviewed and updated with appropriate version control in place.						
1.5.3	Flight Test SMS documentation is readily available to all personnel to include an easily accessed reporting system.						
1.5.4	The Flight Test SMS documentation details and references the means for the storage of SMS related records.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
1.5.5	Flight Test Safety management processes are integrated into existing organizational manuals or data repositories as appropriate.						
1.5.6	The organization exploits the most appropriate medium for the delivery of safety content at both the corporate and operational levels.						

2. SAFETY RISK MANAGEMENT

2.1 HAZARD IDENTIFICATION

The Flight Test organization shall develop and maintain a formal process that ensures that flight test safety hazards are identified, and eliminated or mitigated to as low as reasonably practicable. This should be integral to a thorough test planning process that assesses unmitigated risk and residual risk, with risk acceptance at the appropriately designated leadership level.

EFFECTIVENESS is achieved when Flight Test safety hazards are being identified and managed to achieve test execution excellence. Test hazards and lessons learned are captured in a repository and reviewed in a systematic and timely manner as part of test planning.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
2.1.1	The Flight Test organization employs reporting systems that differentiate between anomalous test results and operational safety of flight incidents.						
2.1.2	The Flight Test organization has an incident reporting system to capture errors, hazards and near misses that is simple to use and accessible to all personnel.						
2.1.3	The Flight Test organization has a robust Flight Test risk management and hazard analysis process that is part of the larger test planning process.						
2.1.4	The safety reporting system provides feedback on incidents, corrective actions and lessons learned.						
2.1.5	Flight Test safety investigations are carried out to identify the unsafe act, the pre-condition(s) for the unsafe act, supervisory, and organizational causes and influences.						
2.1.6	Safety reports are acted on in a timely manner.						
2.1.7	Personnel responsible for investigating safety reports are trained and competent in investigation methods and techniques.						

Indicators of Conformance and Performance *(continued)*		P	S	O	E	How it is achieved	Verification
2.1.8	Personnel express confidence in the organization's reporting policy which is responsive, non-retributional, and affords anonymity.						
2.1.9	The Flight Test organization stipulates a review of lessons learned from incidents and accidents as part of the test planning process.						
2.1.10	Flight Test crew and telemetry personnel have prescribed and adhere to Fatigue Risk Management/Crew Duty Limitations when involved in airborne tasks/monitoring.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
2.1.11	There is an active reporting system that includes reporting targets and expected response time.						
2.1.12	Flight Test personnel are willing to self-report and/or correct a co-worker when needed.						
2.1.13	The reporting system allows personnel to propose preventative and corrective actions.						
2.1.14	There is evidence that the reporting system is easily accessible and is actively used across the entirety of the Flight Test organization.						
2.1.15	The reporting system is available to all employees (including contractors) and there is a provision for an external entity to report an issue.						
2.1.16	There is a process in place to analyze safety reports for hazard trends and issues that may require corrective action outside the direct control for the Flight Test organization.						

2.2   RISK ASSESSMENT AND MITIGATION

The organization shall develop and maintain robust process that ensures identification, assessment, and mitigation of safety risks are managed to an acceptable level.

EFFECTIVENESS is achieved when the risk management process yields Flight Test execution excellence (that includes administration, maintenance, and test flight operations).

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
2.2.1	There is a structured process for the management of risk that includes the assessment of risk associated with identified hazards, expressed in terms of severity, probability, and exposure (i.e., FAA Order 4040.26 Series).						
2.2.2	There are criteria for evaluating the level of risk and a process to accept residual risk at the appropriate level.						
2.2.3	The Flight Test risk assessment process incorporates documentation and tracking of action items and responsible individuals.						
2.2.4	Risk management is routinely applied in decision making processes.						
2.2.5	Effective and robust mitigations and controls are implemented with risk acceptance at the appropriate level.						
2.2.6	Risk assessments and risk ratings are appropriately justified and align with industry standards and/or regulatory guidance as appropriate.						
2.2.7	Corporate leadership has visibility of medium and high risk testing events or maintenance evolutions, the mitigations, and residual risk.						
2.2.8	Flight test has a configuration management plan and seamless coordination and tracking of aircraft modification, instrumentation installs, and operational restrictions.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
2.2.9	There is evidence that risks are being managed to as low as reasonably practicable and account for interdependencies.						
2.2.10	The organization uses its risks management results to develop best practice guidelines that it shares with the industry and flight test community.						
2.2.11	The risk management processes are reviewed and improved on a periodic basis.						
2.2.12	Risk assessments underpin educated residual risk acceptance decisions and enable risk decisions by empowered executives.						

3. SAFETY ASSURANCE

3.1 SAFETY PERFORMANCE MONITORING AND MEASUREMENT

The Flight Test Leadership shall develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls. The safety performance of the organization shall be verified in reference to safety expectations, performance objectives, and metrics of the SMS.

EFFECTIVENESS is achieved when the organization has developed a series of safety performance targets and metrics that are appropriate to the unique demands of flight test. There should be evidence that safety trends are appropriately measured, corrective actions are implemented, and positive results are achieved.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
3.1.1	Flight Test safety expectations and safety performance objectives and metrics have been established and are known throughout the organization.						
3.1.2	Safety objectives and metrics are specific, measurable, and relevant to Flight Test activities.						

		P	S	O	E	How it is achieved	Verification
3.1.3	Safety objectives and metrics are monitored and analyzed for trends.						

Indicators of Conformance and Performance *(continued)*		P	S	O	E	How it is achieved	Verification
3.1.4	Safety performance objectives and metrics are reviewed and updated periodically.						
3.1.5	Test data are analyzed and reviewed to ensure actual results match expected results.						
3.1.6	Flight Test risk mitigations and controls are being verified/audited to confirm they are working and effective.						
3.1.7	Safety audits are conducted that focus on the safety performance of the organization and results are used to continuously improve.						
3.1.8	Information obtained from safety assurance and compliance monitoring activities feed back into the safety risk management process.						
3.1.9	Safety assurance monitoring is conducted throughout the entire Flight Test organization and includes contractors and external entities as required.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
3.1.10	The Flight Test organization critically assesses effectiveness and efficacy of risk mitigations and accounts for consequence, probability, and exposure.						
3.1.11	Safety expectations and performance objectives encompass all areas of the organization.						
3.1.12	Members of the Flight Test team readily accept their responsibility to stop test when doubt exists as to the safety of the evolution.						
3.1.13	Personnel at all levels are aware of the safety expectations and performance objectives in their areas of responsibility, and the results are communicated to them.						

		P	S	O	E	How it is achieved	Verification
3.1.14	Safety performance achievement is included as a success measure of the test team and included as part of individual performance evaluation.						

Best Practice Indicators *(continued)*		P	S	O	E	How it is achieved	Verification
3.1.15	Sufficient resources are provided based on analysis of safety performance metrics.						

3.2 THE MANAGEMENT OF CHANGE

The Flight Test organization shall develop and maintain a formal process to identify changes within the organization and its operation, which may have a safety impact. The change management process will also include the modification of source documentation and SOPs as required.

EFFECTIVENESS is achieved when the organization uses the safety risk management system to proactively assess all major changes to the organization and its operations and accomplish seamless transitions.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
3.2.1	The Flight Test organization has established a process and conducts formal hazard analyses and risk assessments for major operational changes, major organizational changes, new aircraft type, induction of new personnel, and changes in key personnel.						
3.2.2	Safety case/risk assessments are safety of flight test focused.						
3.2.3	Established procedures exist for managing the revisions of flight test documentation and signature authorities are delineated.						
3.2.4	The organization has a critical document revision process and it is being followed.						
3.2.5	Key stakeholders are involved in the change management process.						
3.2.6	During the change management process, previous risk						

assessments and lessons learned are reviewed for relevancy and potential impact.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
3.2.7	Validation of the safety evaluation takes place following organizational and operational changes to assure assumptions remain valid and the change was effective.						
3.2.8	All organizational and operational changes are subject to the change management process.						
3.2.9	Potential safety impacts are reviewed as part of the change management process.						

3.3 CONTINUOUS IMPROVEMENT OF THE SMS

The Flight Test organization shall develop and maintain a formal process to identify the causes of substandard performance of the Flight Test SMS, determine the implications of substandard performance of the SMS, determine substandard performance in operations, and eliminate or mitigate such causes.

EFFECTIVENESS is achieved when the Flight Test organization routinely monitors the Flight Test SMS performance to identify potential areas of improvement, and the outcomes of this process lead to improvements to the safety management system.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
3.3.1	The Flight Test SMS Manager and Flight Test safety committee have the necessary authority to make decisions related to the improvement and effectiveness of the Flight Test SMS.						
3.3.2	The Flight Test SMS is periodically reviewed for improvements in safety performance.						
3.3.3	The Flight Test SMS uses reactive and proactive program evaluations such as internal assessments and external audits to ensure safety assurance objectives are met and are						

effective.						

Best Practice Indicators		P	S	O	E	**How it is achieved**	**Verification**
3.3.4	There is evidence of lessons learned being incorporated into the policy, planning, and procedures.						
3.3.5	The Flight Test organization incorporates proven industry/community practices and is an active promoter of SMS within the aviation industry.						
3.3.6	Surveys and assessments of organizational culture are carried out regularly and the results are sufficiently transparent and feed the continuous improvement life cycle.						
3.3.7	The Flight Test SMS is evaluated on its contributions to and effectiveness towards hazard assessments and incident investigations.						
3.3.8	For safety related services, the organization requires external entities to have an SMS (e.g., suppliers).						
3.3.9	Contractors have the ability to participate and share information in the SMS.						

4.   SAFETY PROMOTION

4.1   TRAINING AND EDUCATION

The Flight Test organization shall develop and maintain a safety training program that ensures that personnel are trained and competent to perform the SMS duties. The scope and periodicity of the safety training shall be appropriate to each individual's involvement in the SMS.

EFFECTIVENESS is achieved when all personnel are trained and competent to perform their SMS related duties and the training program is monitored for effectiveness and updated as necessary.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
4.1.1	There is a documented process to identify safety management training requirements so that personnel are competent to perform their duties.						
4.1.2	Training also addresses safety risk assessments and management principles to address flight test activities.						
4.1.3	Technical training for flight test team members incorporates SMS principles (i.e., human factors, organizational influences, etc.).						
4.1.4	Training programs teach risk assessment, mitigation and contingency planning techniques.						
4.1.5	There is a process in place to measure the effectiveness of training and to take appropriate action to improve subsequent training.						
4.1.6	Training includes initial and recurrent training.						
4.1.7	A training record is maintained for all Flight Test personnel.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
4.1.8	Training includes safety-specific topics in addition to specific technical skills.						
4.1.9	Training requirements are documented for each area of						

	Indicators of Conformance and Performance	P	S	O	E	How it is achieved	Verification
	activity within the organization, including areas where training requirements are not defined by regulations.						
4.1.10	The Flight Test organization has centralized training management.						
4.1.11	Training is provided for the entirety of the Flight Test organization including contractors and outside agencies (e.g., the FAA).						
4.1.12	Personnel have a mechanism to request additional SMS training in relation to their role in SMS.						
4.1.13	Management recognizes and uses informal opportunities to instruct all personnel on safety.						
4.1.14	Personnel are encouraged to seek membership in professional affiliations and attendance at symposia and industry conferences.						
4.1.15	The Flight Test organization conducts training exercises and rehearsals using techniques and methods driven by robust effective planning considerations.						

4.2 SAFETY COMMUNICATION

The organization shall develop and maintain formal means for safety communication that ensures all personnel are aware of SMS activities and necessary time critical changes to safety procedures.

EFFECTIVENESS is achieved when all personnel are aware of the SMS and voice a positive response to the frequency and timing of safety information.

Indicators of Conformance and Performance		P	S	O	E	How it is achieved	Verification
4.2.1	Safety critical information plans, and strategies are communicated throughout the Flight Test organization.						
4.2.2	Significant events and investigation outcomes associated with the organization are communicated to all personnel,						

		P	S	O	E		
	including contractors and external entities where appropriate.						

Best Practice Indicators		P	S	O	E	How it is achieved	Verification
4.2.3	There is a safety communication strategy and practice that is effective in keeping personnel informed.						
4.2.4	The effectiveness of safety communication is routinely assessed and the strategy revised as required.						
4.2.5	Safety-related information is proactively shared with the goal to enhance safety within the Flight Test organization and the flight test community at large.						