

Qualifications Related to Assisting Airports with Design, Specification, Acquisition, and Use of Noise and Operations Monitoring Systems

机场噪声与运行监测系统的设计、规范、建设与使用的相关信息



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Harris Miller Miller & Hanson Inc. (HMMH) was founded nearly 30 years ago to provide the highest caliber of noise consulting services to airports. Our corporate focus on aviation noise permits HMMH to offer airports exceptional qualifications related to the design, specification, procurement, installation, and use of noise and operations monitoring systems (NOMS), including directly related assistance to over 200 airports worldwide, including:

- **NOMS design, procurement, and use consulting assistance to over 60 airports**
- **Responsibility for installation and support of monitoring systems at over 30 airports worldwide when HMMH was active as a NOMS vendor**
- **Development, application, installation, and support of state-of-the-art analysis tools, such as:**
 - RealContours™ automated aircraft noise contour development program
 - InFLIGHT™ ARTS data acquisition, processing, analysis and reporting software
- **Assistance to over 80 airports in development and implementation of “Noise Compatibility Programs” under 14 CFR Part 150; more than any other consulting firm**
- **Design and fabrication of a low-noise monitoring system capable of measuring noise to less than three decibels, in remote areas with low background levels**
- **Assistance in organization, staffing, and training airport noise offices**

HMMH's continuous monitoring system assistance to a comprehensive range of airport types worldwide over the past 30 years ensures that we maintain an industry-leading awareness of vendor capabilities and advances. In many areas, HMMH specifications have driven NOMS advances and capabilities industry-wide. For example, HMMH's design for the new Denver International Airport (DIA) in Colorado, U.S. introduced a generation of systems that incorporate the highest levels of database and analysis integration, noise event identification and classification, and noise and flight track correlation.

HMMH's familiarity with active system vendors and their products ensure that our specifications are comprehensive, practical, and state-of-the-art. We can “push the technical envelope,” without driving up system cost or complexity.

HMMH 公司成立 30 年来致力于向机场当局提供最高水平的噪声咨询服务。HMMH 公司专注于航空噪声的卓越资历，可为机场提供有关噪声与运行监测系统 (NOMS) 的设计、技术规范审定、采购、设备安装及使用培训等服务。HMMH 公司曾经为全球逾 200 个机场提供服务，包括：

- **为 60 个机场提供 NOMS 系统设计，采购支持及使用咨询服务**
- **作为 NOMS 系统供应商曾负责全球逾 30 个机场的 NOMS 监测设备的安装及运营支持**
- **开发、应用、安装及支持最先进的分析工具，如：**
 - RealContours™ 自动化飞行器噪声等值线图开发项目
 - InFLIGHT™ ARTS 数据取得、处理、分析及报告软件
- **在美国联邦法规标题 14 第 150 部指导下协助逾 80 个机场开发并执行“噪声相容性规划”；我们是提供此类服务最多的咨询公司**
- **设计并制作的低噪声监测系统可测得背景噪音较低偏远地区 3 分贝以下的噪声情况**
- **协助机场噪声办公室进行人员组织、配备及培训事宜**

HMMH 公司 30 年间持续不断的为全球范围内许多不同类型的机场提供噪声监测系统的协助，被誉为行业领先者的 NOMS 供应商优势和能力的辨识经验。许多年来，HMMH 公司的 NOMS 先进技术和能力引领了整个行业规范。例如，HMMH 公司在美国科罗拉多州丹佛国际机场 (DIA) 的设计案中，将最高标准的数据库和集成数据分析、噪声事件识别及分类、噪声与飞行轨迹相关联等功能整合在新一代系统中。

HMMH 公司对于现行系统供应商及其产品的熟知确保了我们的技术规范的全面性，实用性以及技术领先性。

HMMH has Worldwide Noise and Operations Monitoring System Experience
HMMH 公司在全球范围内协助建设噪声与运行监测系统的经验



■ Demonstrated Expertise with Noise Monitoring System Hardware and Software and their Application 已证实的噪声监测系统硬件、软件及应用程序等专业技术

HMMH has experience with the software and hardware offered by all active system vendors, including the following leading firms:

- 01 dB – noise measurement hardware
- BridgeNet International – monitoring system software and specialized reports/websites
- Brüel & Kjær (including Lochard) – noise and operations monitoring hardware, and system software and noise measurement hardware
- Dimensions International – aircraft flight track and identification data acquisition hardware and software
- ITT (formerly Rannoch, Era, and SRA) – aircraft noise and operations monitoring hardware, and system software
- Larson • Davis - noise measurement hardware
- PASSUR (formerly MegaData) – aircraft operations monitoring hardware and software

HMMH's system hardware and software experience falls into four principal areas:

- Assistance to airports in system design, installation monitoring, and system acceptance and assistance in their use, protocols and training

HMMH 公司曾与大多数硬件及软件系统供应商有过合作，包括以下主要的公司

- 01dB- 噪声测量硬件
- BridgeNet International- 监测系统软件和专门的报告 / 网站
- Brüel & Kjær (包括 Lochard)- 噪声与运行监测硬件、系统软件和噪声测量硬件
- Dimensions International- 航空器飞行轨迹和鉴定数据取得的硬件和软件
- ITT (前身为 Rannoch, Era, and SRA)- 航空器噪声与运行监测硬件及软件
- Larson•Davis- 噪声测量硬件
- PASSUR (前身为 MegaData)- 航空器运行监测硬件和软件

HMMH 公司在系统硬件及软件方面的经验可分为如下四个主要领域：

- 协助机场进行系统设计、安装监控、系统验收以及在机场使用、协议及培训时提供协助

- Actual system installation and support
- HMMH's own development and application of specialized noise and operations monitoring and analysis software and hardware
- Demonstrated expertise with the latest NOMS technology
- 系统实地安装及支持
- HMMH 公司专门为噪声、运行监测和数据分析软件而自行开发设计的应用程序
- 已证实的最前沿的 NOMS 专业技术

System design, installation monitoring, and acceptance and assistance in their use, protocols and training
在系统设计、安装监控、系统验收以及在机场使用、通讯和数据传送以及人员培训时提供协助

HMMH's technical staff is the largest of its kind specializing in environmental acoustics and noise control. We have built a team of professionals with technical expertise in all areas relevant to monitoring system design, specification, acquisition, testing, and use.

HMMH 公司是拥有此类专门从事环境声学及噪声控制方面技术专家数量最多的公司。我们的技术专家已经组建了一支专业的团队,囊括了有关监测系统设计、技术规范编写、系统数据取得、系统运行测试及使用等全部领域。

Airport (Year Project Initiated) 机场 (按项目开始时间)	System Design 系统设计	Monitor Site Selection 监测地点选定	System Specification 系统标准	Procurement Assistance 协助采购	Installation Management 安装管理	Acceptance Testing 验收测试	Noise-Hardware/ Software 噪声硬件/软件	Tracking Hardware and Software 硬件及软件跟踪	Staff Training 人员培训	Ongoing Support 实时支持
Centennial, CO (2010) 森特尼尔机场, 科罗拉多州	✓	✓	✓	✓	✓	✓			✓	
Martin County Airport / Witham Field, Stuart, FL (2010) 马丁县机场, 佛罗里达州	✓	✓	✓	✓	✓	✓			✓	
Baltimore-Washington International, MD (1984, 2008) 巴尔的摩机场, 华盛顿		✓	✓	✓	✓	✓			✓	✓
Denver International, CO (2007) (system upgrade) 丹佛国际机场, 佛罗里达州	✓		✓			✓				
East Hampton, NY (2007) 东汉普顿 (镇) 机场, 纽约	✓		✓	✓		✓			✓	
Reno-Tahoe, NV (2005) 里诺国际机场, 内华达州	✓	✓	✓	✓	✓	✓				
Beijing, China (2005) 北京, 中国	✓	✓	✓	✓	✓	✓				
Massport, Boston and Bedford, MA (2004) (two-airport system) 洛根机场, 波士顿; 贝德福德机场, 马萨诸塞州 (两套机场系统)	✓	✓	✓	✓	✓	✓				
Indianapolis, IN (2003) 印第安纳波利斯机场, 印第安纳州	✓	✓	✓	✓	✓	✓				
Santa Clara, CA (2003) (three airport system) 圣克拉拉机场, 加利福尼亚州 (3套机场系统)	✓	✓	✓	✓	✓	✓				
Louisville, KY (2003) 路易维尔机场, 肯塔基州	✓	✓	✓	✓	✓	✓				
10 South African Airports (2003) 10个南非机场	✓	✓	✓	✓	✓	✓				
San Diego, CA (2002) 圣地亚哥机场, 加利福尼亚州	✓	✓	✓	✓	✓	✓				
San Antonio, TX (2003) 圣安东尼奥机场, 得克萨斯州	✓	✓	✓	✓	✓	✓				
Allentown, PA (2001) (two airport system) 阿伦敦机场, 宾西法尼亚 (2套机场系统)	✓	✓	✓	✓	✓	✓				
Anchorage, AK (2001) 安克拉治机场, 阿拉斯加州	✓	✓	✓	✓	✓	✓				

Airport (Year Project Initiated) 机场 (按项目开始时间)	System Design 系统设计	Monitor Site Selection 监测地点选定	System Specification 系统标准	Procurement Assistance 协助采购	Installation Management 安装管理	Acceptance Testing 验收测试	Noise-Hardware/ Software 噪声硬件/软件	Tracking Hardware and Software 硬件及软件跟踪	Staff Training 人员培训	Ongoing Support 实时支持
Raleigh Durham, NC (2001) 罗利机场, 北卡罗来纳州	✓	✓	✓	✓	✓	✓				
San Francisco, CA (2001) 旧金山机场, 加利福尼亚州	✓	✓	✓	✓	✓	✓				
Tampa, FL (2000) 坦帕机场, 佛罗里达州	✓	✓	✓	✓	✓	✓				
White Plains, NY (1981 1993 1999) (orig., replacement, upgrade) 白原市机场, 纽约州	✓	✓	✓	✓	✓	✓	✓	✓		
Naples, FL (1998) 那不勒斯机场, 佛罗里达州	✓	✓	✓	✓	✓	✓	✓		✓	
Miami, FL (1997) 迈阿密机场, 佛罗里达州	✓						✓		✓	✓
Sacramento, CA (1997) (three airport system) 萨克拉门多机场, 加利福尼亚州 (3套机场系统)	✓						✓		✓	
Chicago Midway, IL (1995) 芝加哥中途国际机场, 伊利诺伊州	✓	✓	✓	✓	✓	✓				
Chicago O' Hare, IL (1995) 芝加哥俄亥俄机场, 伊利诺伊州	✓	✓	✓	✓	✓	✓				
John Wayne, CA (1995) 约翰韦恩机场, 加利福尼亚州	✓	✓	✓	✓	✓	✓				
Denver International, CO (1993) 丹佛国际机场, 科罗拉多州	✓	✓	✓	✓	✓	✓				
New Orleans, LA (1993) 新奥尔良机场, 路易斯安那州	✓	✓	✓	✓	✓		✓	✓	✓	✓
Palm Beach, FL (1993) (three airport system) 棕榈滩国际机场, 佛罗里达州 (3套机场系统)	✓	✓	✓	✓	✓	✓	✓		✓	✓
Seattle-Tacoma, WA (1992) 西雅图/塔科马国际机场, 华盛顿								✓	✓	✓
Fort Lauderdale-Hollywood, FL (1991) 劳德代尔堡 - 好莱坞国际机场, 佛罗里达州	✓	✓	✓	✓	✓	✓	✓		✓	✓
Fort Lauderdale Executive, FL (1990) 劳德代尔堡伊格泽克尤蒂夫机场, 佛罗里达州		✓								✓
Minneapolis-St. Paul, MN (1990) 明尼阿波利斯-圣保罗国际机场, 明尼苏达州	✓	✓	✓	✓	✓	✓		✓		✓
Nashville, TN (1990) 纳什维尔机场, 田纳西州	✓		✓	✓			✓		✓	✓
Charlotte, NC (1988) 夏洛特机场, 北卡罗来纳州	✓	✓	✓	✓	✓		✓		✓	✓
Columbus, OH (1988) 哥伦布机场, 俄亥俄州	✓	✓	✓	✓	✓	✓			✓	
Denver-Stapleton, CO (1988) 丹佛斯泰普尔顿国际机场, 科罗拉多州	✓	✓	✓	✓	✓	✓				
Salt Lake City, UT (1987) 盐湖城机场, 犹他州	✓	✓	✓	✓	✓	✓				

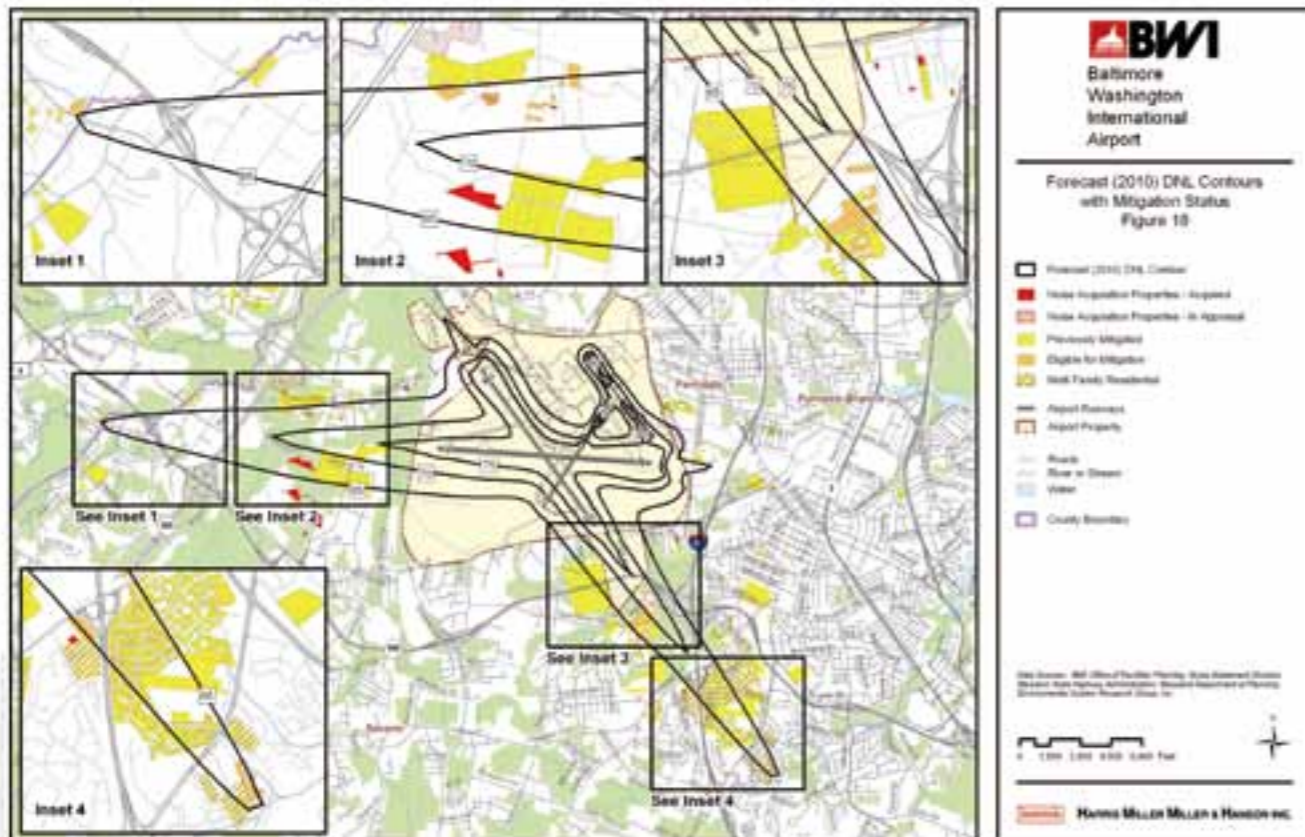
The ultimate value of a monitoring system depends as much on implementation as it does on design. HMMH pays continuous attention to implementation issues. Our related experience includes recruiting, interviewing and selecting staff for airport noise abatement staffs, developing and presenting courses on relevant technical issues, providing on-site and on-call noise abatement staff, noise monitoring system training and developing standard procedures for airport staff in use of the monitoring system.

HMMH's international experience includes assistance to Beijing Capital International Airport (BCIA) in the design, specification, acceptance, and training in the use of the state-of-the-art noise and operations monitoring system (NOMS), as part of the ASH, Inc. Team. Since the opening of the third runway and Terminal 3, the Team has provided training in the daily, weekly, monthly, and yearly use of the NOMS as the airport assesses the existing noise environment and looks for opportunities to improve the environment. Using the data collected and processed by the BCIA NOMS, the Team has completed an evaluation of the existing noise environment and provided BCIA with potential noise mitigation and abatement option for their consideration.

监测系统的最大价值很大程度上取决于我们按照设计执行的程度。HMMH 公司一直在关注执行问题。我们的相关经验包括为机场降噪部门招募、面试并选择工作人员，为相关技术问题设计课程并授课，提供现场或上门服务的降噪工作人员，噪声监测系统培训和为机场人员开发标准程序以使其使用监测系统。

HMMH 公司在国际上的经验包括作为 ASH 公司团队成员协助北京首都国际机场对全球技术领先的噪声与运行监测系统 (NOMS) 进行系统设计、规范编写、最终验收以及人员培训等工作。随着首都国际机场第三条跑道及三号航站楼的启用，HMMH 公司团队培训首都机场工作人员按每日、每周、每月、每年几个时间节点上如何使用 NOMS 生成相应报告以帮助机场评估现有的噪声环境问题，同时寻找机会改善环境情况。HMMH 公司团队用首都机场 NOMS 收集并处理过后的数据完成了一项对首都机场噪声环境现状的评估，并为首都国际机场提供了潜在的噪声缓解及消除办法供其参考。

Noise contour at Baltimore Washington International Airport
下面是美国巴尔的摩机场的噪声暴露环境图



HMMH also provided assistance to the Airports Company South Africa (ACSA) to prepare an investment plan, overall monitoring approach, and specifications for a centralized monitoring system serving the ten major commercial service airports in the Republic of South Africa.

■ **Experience in System Installation and Support**
系统安装及支持方面的经验

HMMH installed and supported airport monitoring systems at over 30 airports in the U.S., Canada, the United Kingdom, and Europe, as part of a division (ANOMSTM) that HMMH operated in the mid-1990s, including the following:

- Birmingham, UK 伯明翰, 英国
- Charlotte (NC) 夏洛特 (北卡罗来纳州)
- Chicago Midway (IL) 芝加哥中途 (伊利诺伊州)
- Chicago O' Hare (IL) 芝加哥俄亥俄 (伊利诺伊州)
- Civil Aviation Authority, UK 英国民航当局
- Denver International (CO) 丹佛国际机场, 佛罗里达州
- Edmonton, Canada 埃德蒙顿, 加拿大
- Ft. Lauderdale Executive (FL) 劳德代尔堡伊格泽克尤蒂夫机场 (佛罗里达州)
- Ft. Lauderdale International (FL) 劳德代尔堡国际机场 (佛罗里达州)
- Gatwick, UK 伦敦盖特威克机场, 英国
- Heathrow, UK 希思罗机场, 英国
- Long Beach (CA) 长滩机场 (加州)
- Miami (FL) 迈阿密 (佛罗里达州)
- Milan, Italy 米兰, 意大利
- Minneapolis (MN) 明尼阿波利斯 (明尼苏达州)
- Minneapolis Pollution Control 明尼阿波利斯污染治理
- Naples (FL) 那不勒斯 (佛罗里达州)
- Nashville (TN) 纳什维尔 (田纳西州)

HMMH 公司也曾协助南非机场公司 (ACSA) 准备投资方案、全面监控手段，并编写了中央监测系统的技术规范，此规范应用于南非共和国十个主要的商业机场。

HMMH 公司为美国、加拿大、英国、欧洲等地逾 30 个机场安装监测系统并提供支持。作为 ANOMSTM 部门的一部分，HMMH 公司从上世纪 90 年代中开始参与运作，共包括如下地区：

- New Orleans (LA) 新奥尔良 (路易斯安那州)
- Oakland (CA) 奥克兰 (加州)
- Orlando (FL) 奥兰多 (佛罗里达州)
- North Palm Beach (FL) 北棕榈滩 (佛罗里达州)
- Palm Beach Park (FL) 棕榈滩花园 (佛罗里达州)
- Palm Beach International, (FL) 棕榈滩国际机场 (佛罗里达州)
- Portland (OR) 波特兰 (俄勒冈)
- Sacramento Executive (CA) 萨克拉门托伊格泽克尤蒂夫机场 (加州)
- Sacramento International (CA) 萨克拉门托国际机场 (加州)
- Sacramento Mather (CA) 萨克拉门托托马瑟 (加州)
- San Diego, (CA) 圣地亚哥 (加州)
- San Jose (CA) 圣荷西 (加州)
- Seattle (WA) 西雅图 (华盛顿)
- Stansted (UK) 伦敦斯坦斯特德机场 (英国)
- Torrance (CA) 托伦斯 (加利福尼亚州)
- Warsaw, Poland 华沙 (波兰)
- Westchester (NY) 韦斯特切斯特 (纽约州)
- Winnipeg, Canada 温尼伯 (加拿大)

■ **HMMH Development of Proprietary Monitoring Software and Hardware**
HMMH 公司自有监测软件及硬件的发展

In addition to our familiarity with the full spectrum of monitoring software and hardware offered by system vendors, HMMH has also developed a broad spectrum of proprietary tools for use on consulting projects. In many instances, airports purchase these tools directly from HMMH for in-house use or as part of an integrated noise and operations monitoring system. These tools fall under three principal areas:

除了通晓系统供应商生产的全部监测用软硬件外，HMMH 公司还为咨询项目自行开发了一系列模型工具。很多时候机场会直接向 HMMH 公司采购这些模型工具内部使用，或作为一整套噪声与运行监测系统的一部分。这些模型工具分为如下三个主要范围：

- Operations monitoring software and hardware - InFLIGHT™
- InFLIGHT™ module to acquire, correlate and report noise
- Software for modeling noise exposure directly from FAA ARTS data - RealContours™

- 监测操作软硬件 - InFLIGHT™
- InFLIGHT™ 模块用以取得、关联噪声并产生报告
- 直接在 FAA ARTS 数据基础上模拟噪声暴露图的软件 - RealContours™



■ **Demonstrated Expertise with the Latest NOMS Technology**
已证实的最前沿的 NOMS 专业技术

HMMH's exceptional level of involvement with the design, installation, support, and use of noise monitoring systems clearly provides the firm with direct experience with a comprehensive range of the latest technology in all areas related to integrated noise and operations monitoring systems. HMMH's technological expertise also relates to the following aspects of our business that result from our specialization in aviation noise:

■ **Staff and Technical Tools with Capabilities in All Relevant Areas**
在所有相关领域拥有实际操作能力的员工以及高性能的技术工具

Monitoring system projects may require the use of a number of technical tools, including computers, computerized models, and noise measurement equipment. HMMH has comprehensive in-house availability of this equipment, including:

- Capability to process and analyze flight track data
- Proprietary analytical programs for specialized noise and operational analysis
- Portable and laboratory equipment for measuring and evaluating noise and vibration, and for assessment of monitoring system performance

HMMH specializes in analysis of environmental noise; offering technical capabilities that translate into credibility for our clients' projects. Firms that perform noise analyses as a sideline cannot offer the technical competence that is required for such credibility.

■ **Flight Track Data Processing and Analysis**
飞行轨迹数据处理及分析

HMMH has developed extensive in-house tools for obtaining, processing, analyzing, and using radar data from a broad range of sources, including the FAA ARTS system, passive radar applications, and international air traffic control agencies (including those of Italy, South Africa, and Great Britain). We employ those tools on consulting projects and in permanent and temporary noise and operations monitoring efforts.

For example, the figure below shows our ability to sort and display NOMS-processed flight track data; HMMH developed the representative departure and arrival model tracks of Boston Logan International Airport

HMMH 公司高水平的参与噪声监测系统的设计、安装、支持以及使用，无疑给这家企业直接带来综合噪声管理监测系统所有相关领域的最全面且最新的技术。HMMH 公司的技术专家也涉及了如下几个方面的业务，根据我们擅长的航空噪声业务划分：

监测系统项目需要能够使用许多的技术工具，包括电脑、计算机化的模型以及噪声测量仪器。HMMH 公司具有这些设备可随时提供客户使用，包括：

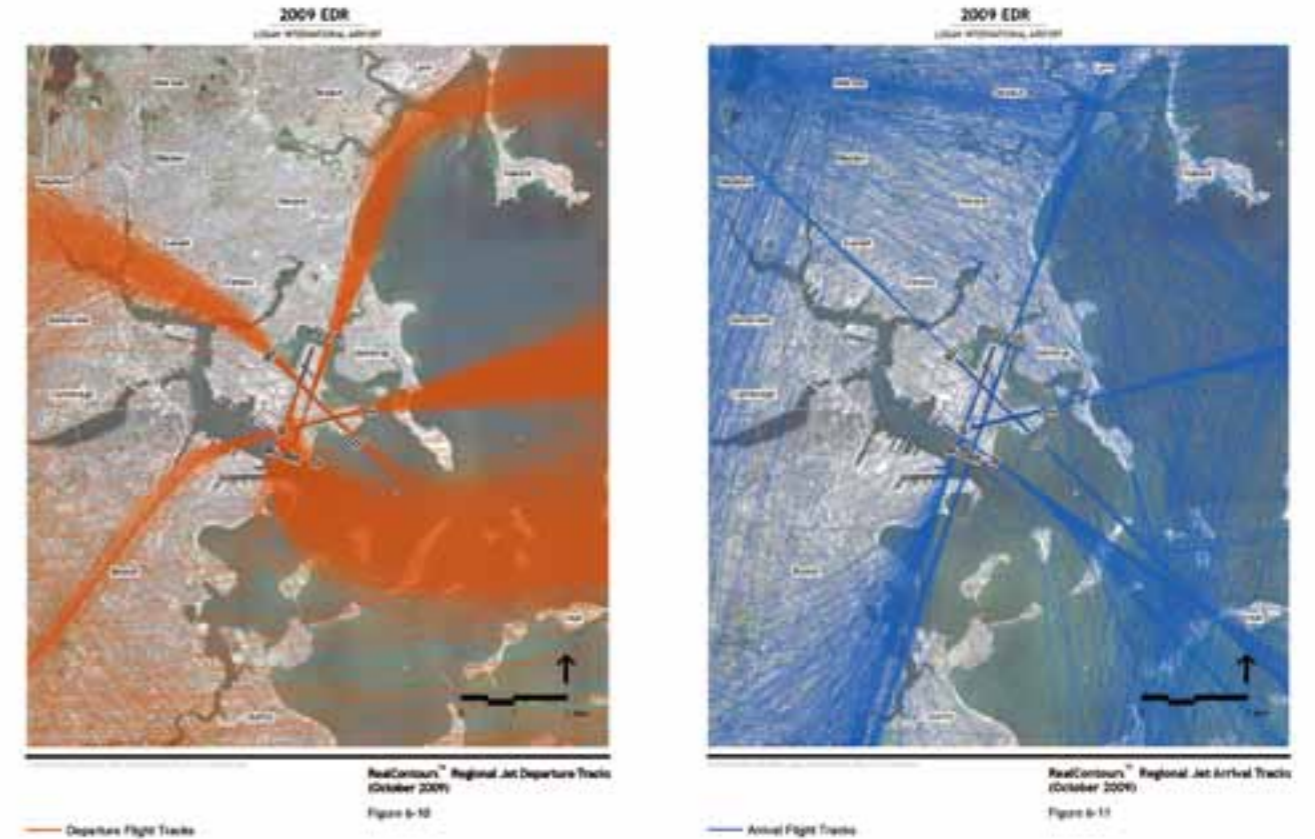
- 可以处理分析飞行轨迹数据
- 专利的噪声分析程序用于特殊噪声运行分析
- 用便携的和实验室内的仪器测量评估噪声和震动，以及评定监测系统性能

HMMH 公司擅长于环境噪声的分析工作；我们提供的技术性能可提升客户项目的可靠性。将噪声分析作为副业的公司无法提供如此可靠性技术能力。

HMMH 公司开发了很多的内部工具用以获得、处理、分析和使用大批的雷达数据，包括 FAA ARTS 系统、无缘雷达应用及国际性的空中交通管制机构（包括意大利、南非和英国等）。我们在咨询项目以及永久性和暂时性噪声及运行监测活动中使用这些工具。

例如，如下图片展示了了我们挑选及显示 NOMS 处理飞行轨迹的能力；HMMH 公司设计了洛根国际机场典型的离场及到达的模型轨迹。

Modeled flight tracks (departures&arrival) at Boston Logan International Airport
模拟洛根国际机场飞行器离场及进场的飞行轨迹（第一个为离场、第二个为进场）



HMMH has installed flight track and identification-related hardware and/or software at:

- Nashville International (TN)
- Minneapolis-St. Paul International (MN)
- Charlotte-Douglas International (NC)
- Salt Lake City International (UT)
- Seattle-Tacoma International (WA)
- New Orleans International (LA)

HMMH has used its flight track and identification data processing capabilities on consulting assignments at over 50 airports worldwide.

In addition, HMMH has developed a breakthrough means of presenting operations data in the form of airspace density plots – figures that depict the relative frequency with which aircraft overfly surrounding communities rather than noise levels. The figure below shows an example of this technique applied to a year (2004) of SAN flight track departure data.

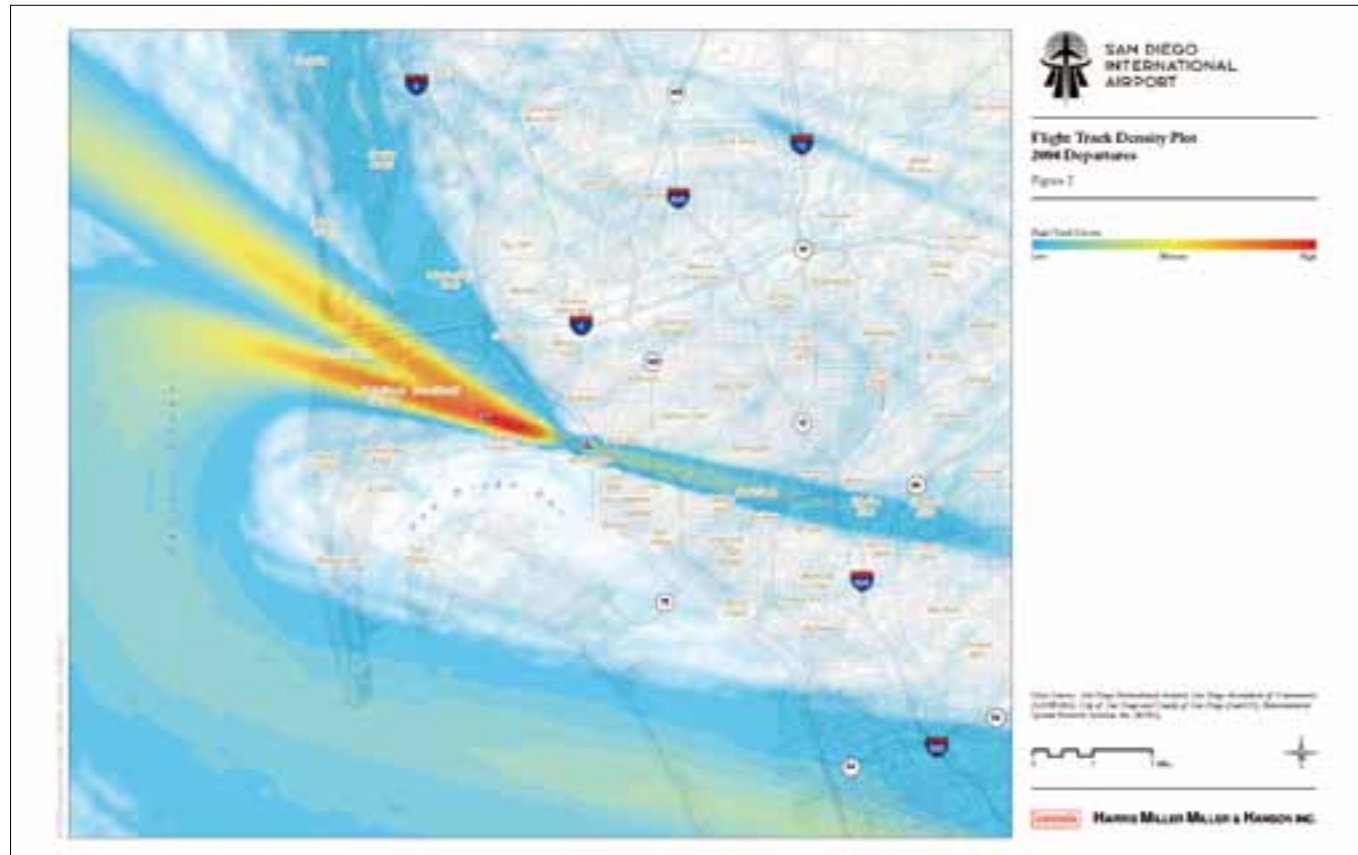
HMMH 公司曾在如下机场安装飞行轨迹识别相关的硬件和 / 或软件：

- 纳什维尔国际机场（田纳西州）
- 明尼阿波利斯圣保罗国际机场（明尼苏达州）
- 夏洛特道格拉斯国际机场（北卡罗来纳州）
- 盐湖城国际机场（犹他州）
- 西雅图塔科马国际机场（华盛顿）
- 新奥尔良国际机场（加利福尼亚州）

HMMH 公司运用其飞行轨迹识别的数据处理能力已为全球逾 50 个机场提供咨询服务

另外，HMMH 公司开发了一个突破性的手段，即用空域密度图来呈现运行数据 - 图形描述了飞行器飞过附近社区空域的相对密度而不是噪声级别。以如下图形为例展示 2004 年这项技术应用于圣地亚哥机场时模拟出的飞行器离场的飞行轨迹数据。

Flight Track Density Plot at San Diego International Airport, California
加利福尼亚州圣地亚哥国际机场飞行轨迹密度图



Software for Modeling Exposure Directly From Flight Track Data
直接根据飞行轨迹数据为噪声暴露建模的软件

A highly specialized application of flight track data is its direct use in modeling noise exposure. HMMH has developed two proprietary software programs for this purpose. (1) ARTSMAP™, based on the USAF NoiseMap model, and (2) RealContours™ based on the FAA's INM. These programs model every operation based on the actual flight track. Airport operators in the following cities use ARTSMAP or RealContours™ to estimate noise exposure at their airports on a regular basis:

- Boston (MA)
- Denver (CO)
- West Palm Beach (FL)
- Los Angeles (CA)
- Van Nuys (CA)
- Ontario (CA)
- Oakland (CA)
- San Diego (CA)
- Reno (NV)

一个高度专业程序下的飞行轨迹数据可被直接用来模拟噪声暴露。HMMH 公司为此目的自行研发了两款软件程序。(1) ARTSMAP™, 基于美国空军噪声地图的工具, (2) RealContours™ 基于 FAA 综合噪声模型。这些程序工具的每个操作都基于真实的飞行轨迹。如下城市的机场管理者定期使用 ARTSMAP 或 RealContours™ 来预测噪声暴露:

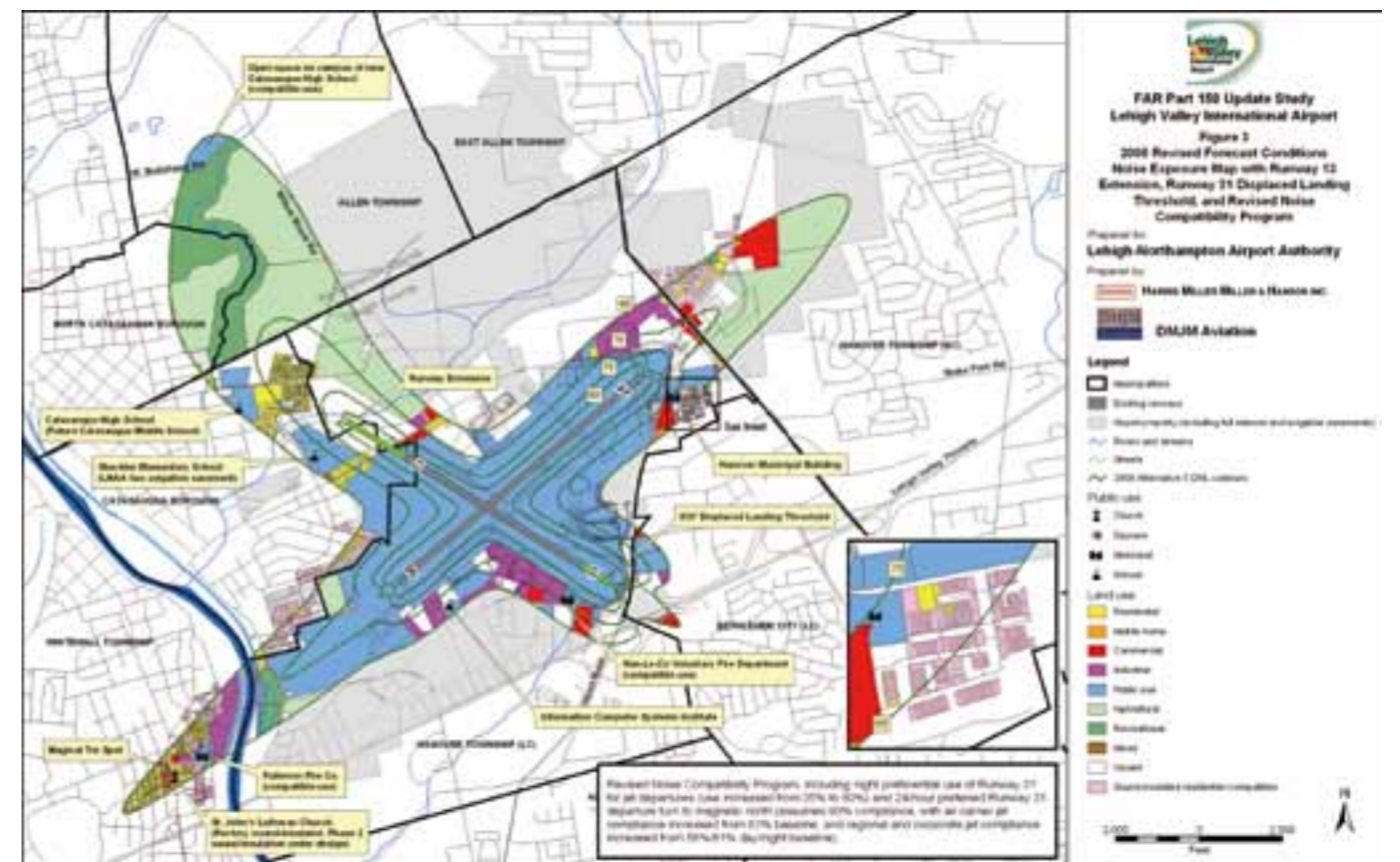
- 波士顿 (马萨诸塞州)
- 丹佛 (科罗拉多州)
- 西棕榈滩 (佛罗里达州)
- 洛杉矶 (加利福尼亚州)
- 凡奈斯 (加利福尼亚州)
- 安大略市 (加利福尼亚州)
- 奥克兰 (加利福尼亚州)
- 圣地亚哥 (加利福尼亚州)
- 雷诺 (内华达州)

Geographic Information System
地理信息系统

Ultimately, the purpose of NOMS is for airports to understand the noise exposure from aircraft operations in the community and to use this information to help improve noise compatibility in community areas. Most NOMS includes base maps with geographic information included, but typically land uses are not readily determined. Most airport noise studies involve overlaying aircraft noise exposure descriptions and flight tracks on base maps depicting land uses, to pick preferred noise routes and to assess the effects – both positive and negative - of changes. HMMH has developed extensive mapping, GIS, presentation, and analysis capabilities to perform these tasks in an efficient, accurate, reproducible, state-of-the-art fashion. The following figure is an example of a recent HMMH Noise Exposure Map in which we employed parcel-level GIS analysis to assist the airport in maximizing FAA funding for implementation of compatible land use measures.

从根本上讲, NOMS 的目的在于让机场了解在社区中由于航空器操作引发的噪声暴露情况, 并运用这些信息来帮助社区所在区域加强噪声相容性建设。大多数 NOMS 有基本地理信息的地图, 但是典型的土地使用信息还没有齐备。大多数的机场噪声研究都包括将航空器噪声暴露描述及飞行轨迹在基本地图上重叠以描述土地使用情况, 并选择首选的噪声路径并评估其变化时产生的正面和负面的影响。HMMH 公司开发了广泛的测绘性能、地理信息系统、演示及分析等性能并用一个有效的、精确的、可重复的、最前沿科技的形式来完成这些任务。如下图片是 HMMH 公司最近的一个噪声暴露地图, 我们采用包裹级的地理信息系统分析来协助机场最大化的利用 FAA 提供的资金执行土地相容性测量。

Parcel-level GIS analysis at Lehigh Valley International Airport, Pennsylvania
宾夕法尼亚州利哈伊谷国际机场的包裹级地理信息系统分析



■ **Non-Standard or Supplemental Noise Analyses**
非标准的或补足的噪声分析

NOMS typically measure single events and correlate those events to a flight operation using the flight track data as the basis. These single events are then used to determine the aircraft cumulative noise metrics, such as hourly and daily metrics. Single event analyses are frequently a critical component of noise studies, particularly at night when both activity levels and background noise levels are lower, and at aviation facilities where the noise concerns largely focus on loud individual events, or specific classes of activity, such as training activity. Frequently, comparisons of the relative noisiness of different aircraft models are an important concern. NOMS assist greatly in these single event analyses.

Noise contours for the “annual average day” as required by the FAA in federal noise studies can mask these types of differences. HMMH uses a variety of “non-standard” or “supplemental” noise analyses to analyze and present noise in the terms that best reflect the issues of concern on each assignment. Single event contours are one such approach; “daily DNL” contours are another.

■ **Single Event Noise Analyses**
单个事件噪声分析

In some situations, it is valuable to compare the noise levels produced by different versions of the same basic aircraft model. For example, the following figure compares areas affected by individual departures of a range of older to newer commercial jets.

In a sense, all of HMMH's projects represent experience that is highly relevant to noise monitoring system development, because our principal business is the analysis of aviation noise. HMMH has assisted over 200 clients on several hundred noise measurement, modeling, and abatement projects. We are recognized nationally as a leader in the field and are regularly sought for assistance on the most controversial and technically challenging projects.

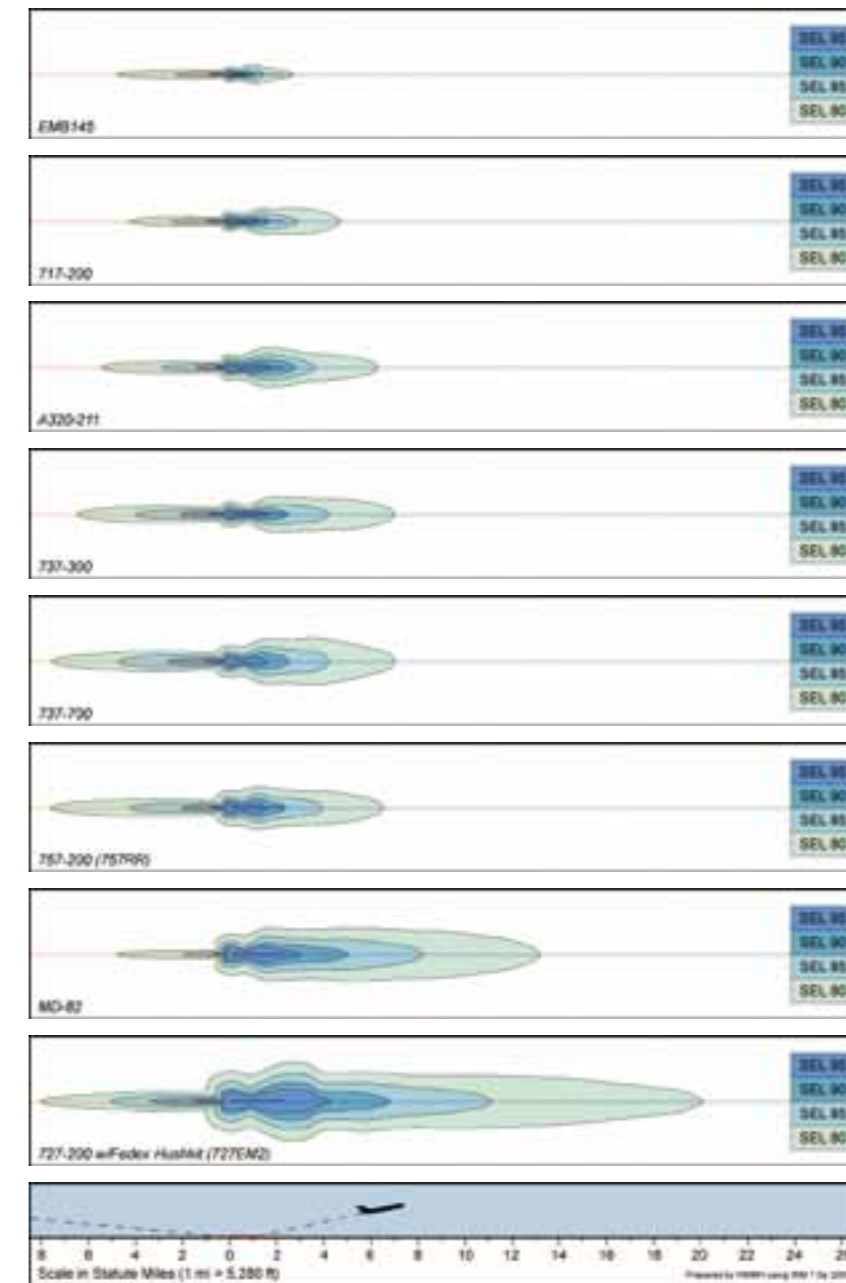
NOMS 使用飞行轨迹数据作为基础，通常测量单个事件后将这些事件关联到飞行操作上。这些单个事件随后被用于确定飞行器的累积噪声测量，例如每小时和每天的测量。单个事件的分析往往是噪声研究的关键部分，尤其在夜间人类的活动噪声以及背景噪声级别都较低的情况下以及在将噪声较高的单个事件作为焦点的航空设施中，或是某一特定的活动，如培训等。往往不同航空器模型间的相对噪声差别的比较是一个重要的考虑因素。NOMS 大大的辅助了这些单个事件的分析。

FAA 在联邦噪声研究中所要求的“年平均每天”噪声等高线图可以显示出多种类型的不同之处。HMMH 公司使用了大量的“非标准的”或“补足的”噪声分析方法来分析并呈现每个任务中能够最好的反应人们所关注的问题的噪声情况。单个事件噪声等值线图就是这样一个方法；“每日昼夜声级”等值线图是另外一个。

在某些情况下，比较不同型号的同种飞行器模型间的噪声级别情况是有价值的。例如，下图（见下页）是对一系列老型和新型的商业喷气式飞机中单个飞行器离场时对相应区域影响的比较。

在某种意义上，HMMH 公司的所有项目都表现出我们和噪声监测系统发展的密切关系，这是由于我们最主要的工作即是航空噪声的研究。HMMH 公司已协助逾 200 个航空设施进行几百种噪声测量，建模以及噪声消减项目。我们被公认为业内的领先者并经常被邀请为最具争议且技术挑战最大的项目提供支持。

Comparison of areas affected by individual departures of a range of older to newer commercial jets
对一系列老型和新型的商业喷气式飞机中单个飞行器离场时对相应区域影响的比较



■ **Why HMMH**
为什么选择 HMMH 公司

Airports make huge investments in monitoring systems. Airports in the U.S. seek assistance from consultants to make sure they purchase a system that will effectively and efficiently meet their needs. The needs assessment

机场为噪声监测系统投入了巨大的资金。美国的机场通过向顾问寻求帮助来确保能够采购到能够买足他们需要的有效的且高效的系统。在系统设



at the beginning of the system design task is often the most important element of the system design process. To expedite acquiring a system, some airports have begun the vendor selection process at the same time as beginning the design process. The airport obtains the technical specifications that the vendors need to install a system that meets the airport's needs around the time they finalize the vendor selection process. A NOMS consultant can also bring our intimate understanding of the available systems and the vendors to assist the airport in selecting a vendor and system.

Acquisition of a noise and operations monitoring system requires an airport to make a large initial capital investment, to commit to significant ongoing expenses, and to enter into a long-term relationship with a specific monitoring system vendor. To ensure that these commitments are made in manner that is as advantageous to them as possible, airports in the U.S. and other countries regularly seek assistance from consultants with experience in the monitoring system design, specification, procurement, use, and support. These consultants represent the airport's interests, to ensure the system meets the airport's specific needs in the most cost-effective manner.

HMMH has internationally leading credentials that provide airports advantages leading to acquisition of the most appropriate monitoring system for the lowest initial and ongoing costs, including:

- HMMH begins the system design process with an assessment of an airport's specific needs, to ensure that the monitoring system is tailored to the airport's particular requirements. Without this step, vendors are likely to propose generic off-the-shelf solutions that might include unnecessary additional-cost elements, while failing to address some specific local conditions.
- HMMH is familiar with current offerings in the marketplace, to ensure that the system reflects state-of-the-art, cost-effective, proven, and reliable technology,
- HMMH has technical capabilities to prepare detailed specifications to ensure the request for proposal and scope of work clearly and completely define the monitoring system vendor's obligations.
- HMMH also has comprehensive technical capabilities related to monitoring the testing the system installation, to ensure that airports receive what they are paying for.

设计任务最初的需求评估往往是系统设计过程中最为重要的环节。为了尽快获得监测系统，一些机场在开始供应商选择的同时进行系统设计工作。在机场完成供应商选择程序的前后，他们即可得到供应商需依照机场需求进行系统安装的技术规范说明书。一个 NOMS 顾问也可提供我们内部了解的系统可用性以及供应商的信息用以协助机场进行供应商及系统的选择。

一套噪声及运行监测系统的获得需要机场拥有很大的初始投资，同时需承诺交付后的长期运营费用，并与一个特定的监测系统供应商开始一段长期的合作关系。为确保这些事项能够以一个尽可能以机场有利的方式进行，美国及其他国家的机场通常都会向拥有噪声监测系统设计，编写技术规范，设备采购，机器使用及后期支持方面经验的顾问寻求帮助。这些顾问代表机场的利益，确保系统在最节省成本的前提下满足机场的特定需求。

HMMH 公司拥有国际领先的信用可向机场提供有利条件最终帮助机场获得一套需最低初始资金及交付后运营费用的最合适的监测系统，包括：

- HMMH 公司在开始系统设计工作前会对机场的特殊要求进行评估，确保监测系统为机场的特殊要求量身定制。如果没有这一步骤，供应商可能会提议使用一般现成的解决方案，而这样往往会增加一些不必要的费用同时不能表现某些特别的当地情况。
- HMMH 公司对目前市场上的设备十分熟悉，我们可以保证购买的系统反应出最新科技、节省成本、并且是经过验证的可靠的技术。
- HMMH 公司拥有相应的技术能力可提供详细的技术规格说明书，以确保监测设备供应商的工作建议和范围的要求等职责被完全地且清晰地定义。
- HMMH 公司也拥有和系统测试及安装相关的全面的技术能力，以确保机场最终得到的系统真正按照技术规范满足了他们的要求。