The Contribution of Human Factors in Getting Safety Right

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What am I going to talk to you about?

What does NATS do?
NATS Strategy
Human Factors
Human Performance
Safety Culture Case Study
Airports Case Study
So how have we done it?
Two Control Centres
- Prestwick & Swanwick

SCOTTISH AREA CONTROL CENTRE

SHANWICK AREA CONTROL CENTRE

LONDON AREA CONTROL CENTRE
London Terminal Control Operations

Controls low level traffic around London and South East England

Including aircraft making approaches and departures to and from the main London airports
En-route ATC

**Prestwick**
Handles on average 2,500 flights/day
Scottish Oceanic Control Centre
Scottish Area Control Centre
Manchester Area Control Centre

**Swanwick**
Handles on average 5,500 flights/day
London Area Control Centre
London Terminal Control Centre
London Military Air Traffic Control

**Whiteley**
Corporate & Technical Centre
Heathrow has over 1,300 flights per day, 90 aircraft per hour.

Heathrow is the busiest 2 runway airport in the world.
NATS Strategy
The NATS Safety Strategy

People Create Safety
Safety Intelligence
Tailored & Proportionate
Challenging & Learning
The Future of Safety in ATM
The NATS Safety Strategy

People Create Safety

Safety Intelligence

Tailored & Proportionate

Challenging & Learning

The Future of Safety in ATM

People are our strength not our weakness
There are 3 elements to how we help people to do their jobs

- How well the person is supported by the things they use to do their job (HMI, technology, airspace, procedures etc.)

- How well the person is prepared for the task (selection, training, confidence, competence etc.)

- How well the person is supported by the organisation (leadership, culture, motivation, reward etc.)
There are 3 elements to how we help people to do their jobs:

- How well the person is supported by the things they use to do their job (HMI, technology, airspace, procedures etc.)
  
  Provide the right TOOLS

- How well the person is prepared for the task (selection, training, confidence, competence etc.)
  
  Provide the right CAPABILITY

- How well the person is supported by the organisation (leadership, culture, motivation, reward etc.)
  
  Provide the right ENVIRONMENT
All 3 elements of Human Performance have to work together
Strategy, HP & HF

People create safety

Business Performance

People need support

Human Performance

Support needs expertise

Human Factors

The Safety Strategy

Safe, effective system performance

Selection, Training, Procedures, Tools & Equipment, Teamwork, Roles & Responsibilities, Wellbeing, Leadership, Change Management, HP Assurance

The key Human Performance areas that deliver safety

Situation Awareness, Workload, Human Centred Design, Fatigue, Training Effectiveness, Change Management, Controller Confidence

The discipline that deals with the underlying Human Factors in work situations and their optimisation
Human Factors in NATS

A team of 23 highly experienced professionals – and growing

Reports to the Director of Safety

Fully embedded into the NATS change process and the Safety Management System (SMS)

We spend most of our time in ops rooms / towers solving real problems

Our vision is to “Optimise Human Performance”
How Human Factors supports Human Performance in NATS

TOOLS
Provide the right TOOLS
Provide the right TOOLS

- Understand the Requirement
- Remove Risks through Human Centred Design
- Identify and Mitigate sources of Human Error
- Support Transition and Change
  - Competency and Confidence
- Provide HF Validation and Assurance
Provide the right TOOLS

Swanwick Centre / Visual Control Towers

- Make sure you comply with the regulations

- Or that you can make a really good case as to why you are deviating from them
Provide the right TOOLS
iFACTS, Swanwick Centre

- Apply ergonomic standards and best practice – they help to avoid future issues
Provide the right TOOLS
Manchester Control Tower

- Identify design options before expensive decisions are made.

An Early Design
Provide the right TOOLS
Manchester Control Tower

• Human Factors staff have to be very “hands-on”
Provide the right TOOLS

Electronic Flight Data, Prestwick Centre

- Involving the users helps to win their “hearts and minds”

The Final Design
How Human Factors supports Human Performance in NATS

CAPABILITY
Provide the right CAPABILITY

Electronic Flight Data, Prestwick Centre

- Train the controller how to use the tools

And

- Train the controller how to control using the tools
**Provide the right CAPABILITY**

HF Training is provided for ATCOs, Managers and Safety Specialists in NATS.

Also provided externally to Regulators, Airport Operators, Airlines and other ANSPs

<table>
<thead>
<tr>
<th>Training available includes:</th>
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<tbody>
<tr>
<td>• Introduction to Human Factors</td>
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<tr>
<td>• Incident Investigation</td>
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<tr>
<td>• Visual Scanning in the Operational Environment</td>
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<tr>
<td>• Fatigue Risk Management</td>
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<td>• Team Resource Management</td>
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<tr>
<td>• Building Personal Resilience &amp; Confidence to Achieve Success</td>
</tr>
<tr>
<td>• Train the trainer</td>
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Provide the right CAPABILITY

Building Personal Resilience and Confidence to Achieve Success

• There is a peak in trainee ATCO failures when they reach the very last stages of training

• By this stage, 98% of the training cost has been spent

• 40% of failures are related to “non-technical skills”

The Approach

• Training Course
  8 modules delivered over 2 days
  Self reflection and analysis
  Tailored and bespoke approach

• 1:1 Coaching
  Three 1.5 hour sessions over a number of cycles
  Bespoke support using workbook, exercises, training materials, and Instructor and Training Manager support

“I have been involved in many aspects of training, but the 1-2-1 coaching and resilience courses have been (in my opinion) the biggest cultural shift to training during my thirteen years in NATS.”
How Human Factors supports Human Performance in NATS

ENVIRONMENT
Provide the right ENVIRONMENT

Heathrow Control Tower

- Don’t forget the personal issues
Provide the right Environment

Fatigue Awareness Training

Mandatory for ALL Controllers, Assistants and Operational Engineers in NATS

Mandatory for ALL Managers of Controllers, Assistants and Operational Engineers

Advisory for all other staff
Provide the right ENVIRONMENT

Safety Culture

MANAGEMENT COMMITMENT
RESOURCING
JUST CULTURE, REPORTING & LEARNING
RISK AWARENESS & MANAGEMENT
TEAMWORK
COMMUNICATION
RESPONSIBILITY
INVOLVEMENT

Unfavourable
Neutral
Favourable
Provide the right ENVIRONMENT
Change Management

ANTECEDENTS

Content
Attributes of the Initiative Being Implemented

Context
Attributes of the Environment Where Initiative is Implemented

Process
Steps Taken to Implement the Initiative

Individual Attributes
Attributes of the Employees Where Initiative is Implemented

PSYCHOLOGY OF CHANGE

Perceived Change Readiness

Perceived Stage of Change

CONSEQUENCES

Individual Impacts

Team Impacts

Organisation Impacts
Provide the right ENVIRONMENT
Leading Indicators

- Measures events that go wrong
- Measures the positive things people do
- More data = greater ability to proactively manage safety risk

- Day 2 Day Safety Observations
- Open Reporting
- Incident Investigation
To optimise Human Performance, **ALL** aspects of the framework have to be considered.
HP and HF in the Safety Management System (SMS)

“It is critical that HF is fully integrated into Safety Management Systems (SMS) as the human remains at the heart of the ATM system, and therefore HF is a key enabler for ATM safety.”

(Eurocontrol)
"HF awareness increases efficiency, reduces error and can provide significant returns on investment. These cost savings, along with an obligation towards safety and a robust Safety Management System should provide an incentive for organisations to develop their Human Factors programmes."

(UK CAA)
HP and HF in the Safety Management System (SMS)

Considerations

- How will Human Performance risks be identified and how will they be mitigated? How do people create safety?
- Are Human Factors activities effective? Do they add value?
- Are the Human Factors activities proportionate to the risk faced within the organisation?
- What else could the organisation do to improve their Human Performance or to reduce their human risk?
HP and HF in the Safety Management System (SMS)

Key Areas for HF Integration

- System Design (people, procedures & equipment)
- Managing Change
- Hazard Identification
- Risk Management
- Safety Behaviours
- Safety Culture
- Safety Reporting
- Incident Investigations
- Training
- Competency
Human Factors plays a key role in optimising Human Performance and delivering the Safety Strategy.

- The discipline that deals with the underlying Human Factors in work situations and their optimisation.
- The key Human Performance areas that deliver safety.
- The Safety Strategy.

Business Performance

Human Performance

Human Factors
Case Study

Safety Culture
What is Safety Culture

A “Just Culture” is an atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour.
Poor Safety Culture contributes to accidents
The Process

Questionnaire

Workshops

Plan to Improve

Survey the population
1. General section
2. Controllers/Assistants
3. Maintenance/Engineering
4. Managers

Safety Culture improvement process
- Questionnaire Analysis
- Identify Key Issues
- Understanding the Issues
- Analysing the Issues
- Prioritising the Issues
- Solution proposal
- Feedback to Management & Staff
- Improvement Strategy

After the workshop
Who does it apply to?

- Management
- Operational
- Other Staff
- Technical
Safety Culture

- Teamwork
- Risk Awareness
- Commitment
- Responsibility
- Involvement
- Learning and reporting
- Communication
- Trust
Questions, more questions...

44. Team meetings are used to communicate concerns and collect ideas for improvements.

45. Engineering knows the importance of systems failures (in order to maintain provision of safe services).

46. Engineers get sufficient training, prior to major changes being made.

47. The other people in the organisation do not understand our job and the safety roles we fulfil.

What other topics (safety or otherwise) do you feel you would like more information on?

Please tick as appropriate:

<table>
<thead>
<tr>
<th>Role</th>
<th>Watch Manager</th>
<th>Watch Supervisor</th>
<th>Systems Manager</th>
<th>Systems Engineer</th>
<th>Other</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of years experience in current role?</th>
<th>Watch Staff</th>
<th>Day staff</th>
<th>Normal working hours</th>
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Example Metrics

Senior management takes action on the safety-related issues that we raise (G8)
- 25% Unfavourable
- 22% Neutral
- 53% Favourable

If an internal audit revealed that certain procedures were not being adhered to, I would investigate the reasons why (M7)
- 3% Unfavourable
- 9% Neutral
- 88% Favourable

My concerns about safety would be acted on if I expressed them to my manager/supervisor (E8)
- 19% Unfavourable
- 31% Neutral
- 51% Favourable

My concerns about safety would be acted on if I expressed them to my manager/supervisor (C15)
- 32% Unfavourable
- 31% Neutral
- 37% Favourable
Radar Diagram
Sequence of Events

- Dip test
- Action plan
- Roll out

Safety Culture Survey
- Questionnaire
- Workshops
- Report
- Action
- Learn

Repeat....
Case Study

HF in Air Traffic Control Towers
What is an ATC System?
None of this works without....

People

ATCOs
› Air Traffic Controllers
› Licenced by the Government

Air
› Arrivals
› Departures

Ground
› Ground Movement Controllers

Support
› Lighting Panel Operators
› Engineers
› Managers
Heathrow Tower – Why did it need to be replaced?
What was HF involvement?

Design of the interior and layouts
HMI design for components
Human Error Risk Analysis
Then.....

It's not just a new Tower
It’s a:

➢ New way of working
➢ New strip management system
➢ New location
➢ New entry and exit procedures
➢ New watch organisation
➢ New training requirements
➢ New orientation
➢ New Terminal (5)
Action Plan

Growing rift between actors
Identify Concerns
Identify potential Errors
Evaluate impacts

» Manage potential risks
» Training plans
» Training Effectiveness
» Competence
» Shadowing
» Confidence
Go Live!

Heathrow’s new tower handled its first flight early on Saturday 21 April 2007.
Workload, Culture and Safety
How have we done it?
Human Factors in Design: Why is it important?

- We rely on control room operators
- Physical interface design & cognitive interface design
- A Eurocontrol study of accidents across aviation and nuclear industries concluded that approximately 50% of all accidents or incidents had a root cause in design – Roelen, 2004
What if HF isn’t involved in the design process?

- Efficiency: business
- Complex issues discovered later
- Less able to represent customer need
- Fewer options considered
- Less value from evaluation
- More uncertainty
- Less user buy in/ momentum
- More expensive changes
- Human error
Adding value through incorporating HF into the design process

- **Efficiency**
  - Supports human operator
  - Increases productivity
  - Business

- **Time & Cost**
  - Reduces training
  - Reduces development costs
  - Reduces maintenance costs

- **Quality**
  - Improve user experience
  - Provides competitive advantage, for example by improving brand image
Adding value through incorporating HF into the design process:

Return on investment

• Metrics
  o Business
  o HSE aspects

• Shell international (Van Uden 2003)
  o 0.25 - 5 % reduction of capital expenditure,
  o 1 - 10 % reduction of the total engineering hours
  o 3 - 6 % reduction of operational and maintenance life-cycle costs of facilities
How do we incorporate HF into the design process?

1) Getting involved

- Formal process
- Building relationships
  - Managerial
  - Suppliers
  - End users
- Clear, pragmatic communication in multidisciplinary teams
- Show value added
  - To the business
  - To safety
  - To the end user
How do we incorporate HF into the design process?

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- Formal process
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How do we incorporate HF into the design process?

2) Incorporation of HF at different design stages

- The ideal: contribution at the early stages
- Later stages in the design cycle
  Undesired but can still add value
- Contribution for a commercial ‘off-the-shelf’ system

Overarching principle: Apply robust, scientific, HF principles, in a pragmatic way
and Finally

You know when you’ve arrived when....
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