# Human Performance Optimisation Interventions and Measures of Effectiveness in Air Traffic Control

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## **SUMMARY**

This paper outlines three programmes forming the Human Performance Optimisation (HPO) area of work within the Human Factors (HF) and Human Performance (HP) team at NATS, Air Traffic Control (ATC): HP Coaching, Performance Mindset and the HP Buddy Programme. Pre-cursors and drivers, development, application and analysis are described as well as additional work to evaluate and improve effectiveness measures for single and combined interventions.

#### **KEYWORDS**

Human Performance Optimisation (HPO), Coaching, Air Traffic Control (ATC)

## Introduction

Training and working as an ATC Officer (ATCO) is rewarding but can bring with it operational and personal challenges, as well as perceived pressures that have the potential to impact on workplace performance. For example, loss of confidence may be experienced by a trainee after a challenging training session or by an ATCO after a return to work or post incident.

With safety the key priority, it is well recognised that viewing non-technical aspects of performance alongside the technical can support the optimisation of performance as well as contribute positively to individual experiences of work and personal well-being (Flin et al, 2008).

## The HP Optimisation Work Stream

The benefits of optimising human performance in NATS as a safety critical industry are wide ranging and include improving understanding, management and awareness of non-technical factors that underpin and enhance technical skills. Non-technical factors include teamwork, communication, information processing (decision making, situational awareness, workload and threat and error management), human resilience (including confidence, adaptability, purpose, and social support; stress and fatigue management). Application of these skills alongside the technical combine to support the improvement of safety and drive positive behaviour and culture.

In recognition of the above, the HPO workstream at NATS consists of three inter-related areas which have evolved over six years. The programme comprises interventions designed specifically to support, develop and optimise performance through the provision of one- to- one coaching time, facilitated discussion-based sessions and the sharing of relevant tools and resources.

# The HP Coaching Programme

The benefits of coaching to support individual performance and development are widely recognised. The HP Coaching Programme was set up in 2019 to make strengths based coaching support available for all operational roles within the ATC environment to help overcome non-technical challenges. The solutions focussed OSKAR model (Jackson and McKergow, 2002) has been the preferred approach taken due to a forward focus and has been applied consistently across coaching sessions to support the identification of outcomes and actions to develop non-technical awareness and skills. Six structured coaching sessions are offered as the optimal number to provide an opportunity to establish new habits and work towards specific goals (Rock and Schwartz, 2014).

Coaching is only of benefit when individuals are open to the challenge of self -reflection and development (Cox et al, 2018). HP Coaching is therefore not mandatory or provided to all operational trainees but is available and allocated on request, often in response to a training or performance- based challenge. A referral is made via a line or training manager in collaboration with the individual.

During 2024, the HP Coaching team provided 120 coaching sessions with key session themes being confidence (65%), mindset (50%), management of perceived pressure and nerves (33%) and management of feedback (21%).

## The Performance Mindset Programme

The Performance Mindset group intervention was introduced in 2023 to address the most common HP challenges faced in ATC training. It was recognised that whilst HP Coaching support was able to address challenges for individuals on a one to- one basis, the knowledge, tools and strategies discussed within coaching sessions could benefit all trainees if packaged into a group intervention as a proactive method of support.

Programme content was developed following thematic analysis of topics arising in HP Coaching sessions with ATC trainees in 2021/22. Mindset was identified to be the key theme within non-technical skills. Other areas included assertiveness, confidence, perceived pressure, emotional resilience, motivation and impact of emotions on performance.

Collaborating with Unit and Training Managers, themes emerging from coaching data at distinct phases of training and pinch points in the training pathway were identified alongside additional relevant content. The Performance Mindset programme was developed to consist of five core sessions spaced strategically across the training pathway from basic training through to near validation. It comprises of facilitated sessions to introduce learners to a range of research-based techniques around non-technical skills applicable to the ATC context. Sessions provide the space for learners to share experiences, discuss strategies for overcoming challenges and use resources and tools for personal development. Session content includes topics such as values, strengths, healthy performance habits, goal setting, building confidence and locus of control. Since the inception of the programme, 71 sessions have been delivered with 272 learners having attended at least one session.

Performance Mindset sessions reinforce principles and learning covered by regulatory content such as those relating to stress and error management, fatigue, communication and well-being. Over time and after review of feedback and reported benefits, sessions are mandatory and timetabled throughout the training programme.

## The Human Performance Buddy Programme

The HP Buddy Programme was set up in early 2024 to combine coaching for non-technical skills with a mentoring approach. Key drivers for implementation were to improve sharing of knowledge, skills and experience already present in the organisation and as a solution for the high demand for HP Coaching. The programme provides first line support to learners in ATC and engineering in both technical and non-technical skills and has been achieved by training HP Buddies to work with learners in the same role to facilitate the improvement of performance and help navigate through training challenges. Benefits to the business include increased support for learners, earlier and more accessible intervention and efficient use of resource, optimising the knowledge, skill and experience available.

HP Buddies receive training in effective coaching skills and use of HP resources in non-technical areas relevant to the training environment and take an approach that supports and encourages learners to be self-led and proactive in their own development. The programme uses the GROW model of coaching (Whitmore, 1992) as the preferred approach for simplicity and goal focus. An additional key role of an HP Buddy is to triage, signpost and refer to alternative support if required.

There are currently 20 trained HP Buddies across the organisation in both ATC and engineering roles. 17 individuals have received support over 29 sessions, key themes being confidence, resilience, visual scanning, ATC planning tasks and mindset.

# Feedback, Data Collection and Analysis

For each intervention, data is continuously collected and used to make iterative improvements across the programme. Number of referrals, sessions delivered, themes of support, topics discussed, feedback from referrers, coaches and delegates is recorded for analysis and review. Subjective feedback is also gathered to indicate the benefits of the interventions in support of goals (for example passing a phase check or gaining validation as an ATCO:

"I had my validation board yesterday and was successful. Thank you for all your help, I had a lot of confidence going into the board after our sessions. Many thanks" (Coachee)

"You'll be pleased to hear I had a really good day of controlling yesterday. After one session in particular I got a very positive debrief full of praise, within earshot of at least 5 members of my OJTI team. That felt really, really good. You'll say now that it's all because of my hard work, but it's also because of your help, so really thank you very much!" Coachee)

Hopefully the second session was as positive and constructive as the first.....X has definitely been demonstrating a more positive mindset since your first session together. Cheers. (Referrer)

This type of feedback highlights the coaching support provided is perceived to provide a positive benefit by both learners and referrers in terms of improved experience, performance and results.

Future work may involve widening the scope to include On the Job Training Instructors (OJTIs), Operational ATCOs and making content more accessible such as extending Performance Mindset sessions to interactive online content.

## **Evaluating the Effectiveness of Human Performance Optimisation Interventions**

Although significant subjective evidence of the quality of these programmes has been reviewed, a lack of objective data hindered efforts to demonstrate return on investment (ROI), refine interventions, and secure resources. With rising engagement, it is critical to evaluate the effectiveness of these programs to sustain and optimise their contribution to training in a safety-critical environment.

# Method

The project employed the Define, Measure, Analyse, Improve and Control (DMAIC) framework, a structured approach to process improvement. Lean and Six Sigma tools, including process analysis, root cause analysis, and improvement analysis were used to evaluate current processes and identify opportunities for improvement. The project aimed to understand the effectiveness of HPO interventions since the introduction of Performance Mindset in May 2023, to define the benefits of both independent and combined interventions.

# Outcomes

# Define

The problem statement was defined as: *"How can we track the effectiveness and benefits of structured human performance interventions at NATS?"* The extent of the problem was considered, identifying key challenges in assigning budgets due to a lack of demonstrable return on investment, targeted improvement of interventions, stakeholder engagement and reduced job satisfaction.

A Supplier, Inputs, Process, Output, Customers (SIPOC) analysis revealed the existing process to be error prone and labour intensive for practitioners.

# Measure

Qualitative and quantitative data were collected from stakeholders and practitioners regarding their experience of gathering, analysing, and presenting data on HPO intervention effectiveness through a series of interviews and surveys.

A database was created to map data collected pertaining to HPO interventions to effectiveness outcomes, enabling identification of key wastes. Reviews of quantitative data demonstrated the cost of intervention provision to date highlighting significant investment with unproven effectiveness.

# Analyse

An initial brainstorming tool identified emerging causes of challenges in the process of evaluating HPO intervention effectiveness according to "people", "process" and "technology" from the data collected in the Measure phase. An affinity diagram was completed resulting in seven emergent themes. A root cause analysis using the "five whys" method (Liker, 2004) identified the primary issue as: "Definitions of effective HPO interventions have never been clearly defined."

Due to the nature of the problem presented, it was identified that outlining a definition of effectiveness would be insufficient to define the benefits brought about by HPO interventions. Additional causes were considered from the affinity diagram and barriers to improve were agreed: Data is highly dispersed; Data quality is poor (fragmented and incomplete datasets); Data analysis processes are manual and time consuming.

# Improve

An initial improvement tool to simplify, eliminate, combine, automate or reallocate (SECAR) steps of the existing process was completed against each key root cause. An Ease-Benefits tool identified appropriate improvement steps to define, measure and present data.

Agreed steps included: Generate definitions of effectiveness for each intervention; Update data gathering methods to align data points to effectiveness marker; Align data collected across the training organisation to effectiveness markers; Create dashboard to demonstrate HPO intervention contributions to training outcomes.

To create the dashboard, a range of effectiveness statements were mapped to quantitative data gathered through feedback forms and HP Coaching Session Records (Table 1).

HPO Intervention	Effectiveness Statement	Data Location	Scale of Measurement
HP Coaching	There are observable changes in Confidence, Resilience and Response to Feedback	Coachee and Referrer Feedback Forms	Nominal
HP Coaching	HP Coaching is recommended	Coachee and Referrer Feedback Forms	Interval
HP Coaching	HP Coaching improves self- perceived performance in problem specific areas.	Coachee Feedback Forms, HP Coaching Session Record	Interval
Performance Mindset	Learners embed learning from sessions.	Performance Mindset Feedback Forms	Nominal
Performance Mindset	Performance Mindset is recommended	Performance Mindset Feedback Forms	Interval
Performance Mindset	Performance Mindset improved self-rated Confidence, Resilience and Response to Feedback	Performance Mindset Feedback Forms	Nominal

Table 1: Effectiveness Statements with data mapping to data held within Human Performance

Additional quantitative measures were included for the effectiveness statements in Table 2. Correlations between scores on training objectives over the time HP Coaching was received by an individual were completed to demonstrate impact of HP Coaching on overall and individual objective achievement. Training data was also correlated with the number of HP Coaching sessions received by an individual to demonstrate optimum length of engagement in HP Coaching.

HPO Intervention	Effectiveness Statement	Data Location	Scale of Measurement
HP Coaching	HP Coaching improves performance in assessment of ATC specific skills	TRACER Individual Training Record	Nominal
HP Coaching	HP Coaching reduces the need for instructor guidance in specific ATC skills	TRACER Individual Training Record	Nominal
HP Coaching	There is an optimum number of HP Coaching sessions for improved ATC performance	TRACER Individual Training Record, HP Coaching Session Record	Ratio
Performance Mindset	Completion of the full Performance Mindset programme is associated with reduced overall training duration	Performance Mindset Tracker, Average Training Time	Ratio

Table 2: Effectiveness statements with data mapping to data held in Operations Training records

# Control

The implementation of a dashboard as a minimum viable product is underway by working collaboratively with Operations Training and Analytics teams. The preliminary version of the dashboard provided a centralised view of intervention effectiveness and has undergone initial changes following stakeholder feedback, including the display of data for easier customer readability and additional measures of effectiveness. For example, an updated version of the dashboard will include correlation analysis of topics covered by individuals in the Performance Mindset sessions and those explored in HP Coaching, to understand whether group interventions mitigate the requirement for one- to- one support on the same topic at the same level in ATC training.

Moving forward, the dashboard will allow practitioners and stakeholders to monitor performance of the programme, identify trends, and refine strategies as needed. Ongoing monitoring and updates will ensure the process remains robust and adaptive to future challenges. Planned controls to identify continuous improvement actions include stakeholder surveys and practitioner feedback on the process of data provision for the model. Future improvements to the dashboard have been identified throughout the process, requiring further data collection and the inclusion of HP Buddy data. In the future, the dashboard will demonstrate the impact of HPO interventions on predicted training duration for ATC trainees.

# Conclusion

The HPO interventions at NATS provide a layered approach to support including coaching skills in conversations, human performance coaching and group support to develop and learn tools, strategies and share experiences. This combination of support enables individuals to improve their non- technical skills alongside the technical to optimise progress. The layered approach has a number of advantages, i.e. early triaging of HP issues, increased awareness of support available, proactive as well as reactionary measures and an expanded reach compared to a single mechanism. This model could be applied to other settings outside of ATC where resources are tailored specifically to the environment.

HP interventions can be measured and communicated using a structured approach. Defining intervention-specific metrics and aligning data collection processes with these measures are critical to ensuring transparency and optimizing outcomes. Dashboards offer a practical solution for presenting complex data in an accessible way.

By adopting an improvement methodology, NATS can enhance the credibility and sustainability of its HPO interventions, ensuring continued support for non-technical skills training in a safetycritical environment. These findings contribute to a growing body of evidence supporting the need for rigorous evaluation frameworks in human performance initiatives. Widening the support to other areas of the business such as On the Job Training Instructors and making content more accessible such as extending Performance Mindset sessions to interactive online content are all in the pipeline.

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