Advanced Steam Traction Trust

Outreach & the K6 Rotary Engine

David Gibson & Owen Jordan

2018 Autumn Conference
Bury
29th September 2018



Money makes the world go round…







But what happens if you don’t have any?…



Or else you have it, but don’t want to spend it!…

THE ANSWER



Outreach!

What is it?

How do we do it?



Outreach!

How can it help us?

Next Steps?



Outreach – What is it?

- ‘Outreach is shorthand for ‘reaching out’.
- Seeking to engage with others with whom you believe you share a common purpose, or with whom you can achieve mutual benefit.
- Sometimes the common purpose is obvious, such as charities coming together under the ‘Disasters Emergency Committee’ umbrella.
- Often it is not about common purpose, but mutual benefit.
- Different individuals and/or organisations can come together to makes something happen, but for different motivations and benefits.



Outreach – How can it help us?



Projects require resources to make them happen!



Outreach – How can it help us?

Types of Resources Needed to Undertake an ASTT Project:

Accounting

Mechanical Engineering

CAD

Fundraising

Website Management

Software Engineering

Chemical Engineering

Communications & PR

Leadership

Manufacturing

Business Planning

Teamaking

Testing Facilities

Data Analysis

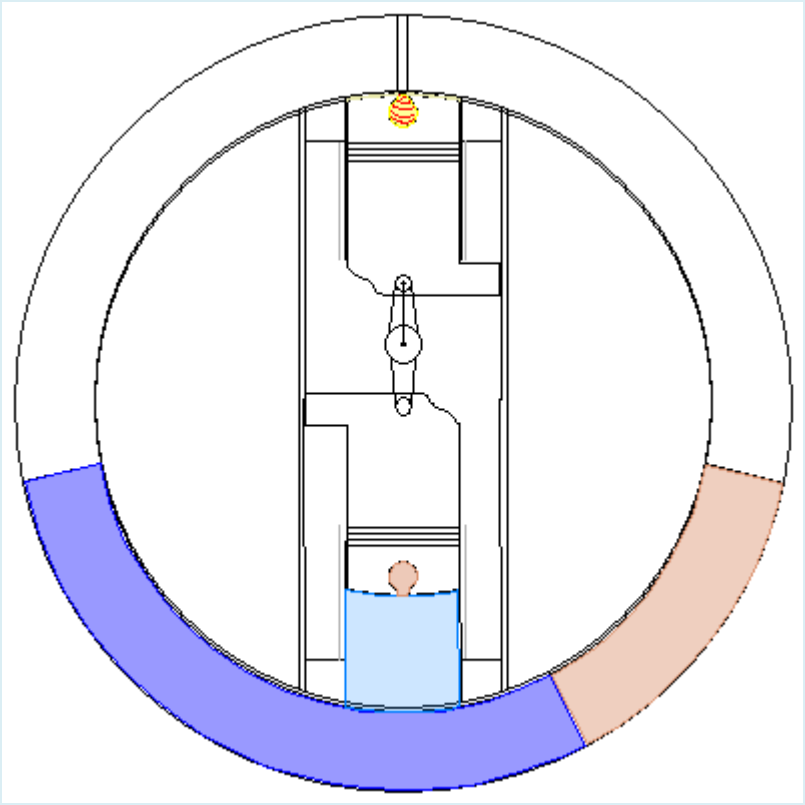


Outreach – How can it help us? (2)

- Out of these resources:
  - Some we can comfortably provide ourselves.
  - Some we could provide ourselves, but may benefit from some help.
  - Some we are unable to provide ourselves.
- Which resource fits which category will depend both on the project and the resources within ASTT at the time.
- All of the previously-mentioned resources are capable of being bought in if the ASTT doesn't have them (or in order to meet deadlines), but this should be as a last resort.
- Outreach can help us to achieve key elements of a project at low (or even zero) cost.



Outreach – How can it help us? (3)



K6 Rotary Engine – A Case Study

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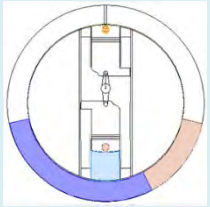
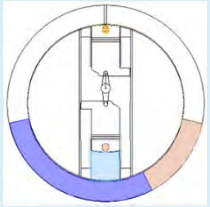
A.K.A.





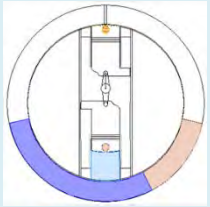
K6 Rotary Engine – A Case Study

- The K6 ‘York’ Rotary Engine was conceived the night of 6th/7th January 2016 by Owen, whilst trying to get under Network Rail’s 2.6T axle weight limits for 100mph+ steam running.
- The potential for Internal Combustion (IC) application was very quickly realised.
- A search of some 2,000+ patents made clear that if anyone had previously thought of the idea, they never filed an application.
- The identified benefits of the K6, as compared to conventional pistons arrangements, were so significant that we struggled to believe them.
- We knew that if we were struggling, then others would struggle.
- The next 3 months were spent trying to get our brains around what had been conceived.



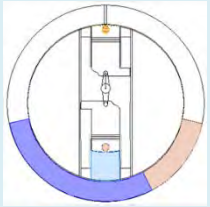
K6 Rotary Engine – A Case Study (2)

- After doing as much as we could (or rather Owen could) to analyse and sanity-check core design features, we could do no more ourselves.
- Having decided that it was worth investing a small amount of money, a UK Patent Application was filed in April 2018.
- We needed an expert in engine design and thermodynamics to take a look.
- We had attempted to approach Academia in the past in order to gain support for Owen's 2nd Generation Rail (2GR) Project, but without success.
- As a result of the RAILFAST project, David Gibson already had connections with University of Birmingham's (UoB's) Centre for Railway Research & Education (BCRRE).



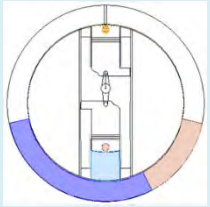
K6 Rotary Engine – A Case Study (3)

- Thanks to Prof. Felix Schmid at the BCRRE, we were introduced to Prof. Miroslaw Wyszynski from the Mechanical Engineering Department, who kindly gave us a hearing.
- Both of us half expected the Prof. Wyszynski to immediately point out one or more fundamental flaws, but he instead agreed to give the project to some of his students.
- Over the course of 18 months several students looked at one or more aspects of the design, showing that the engine was workable and that it did indeed have a number of potential advantages over conventional engines.
- This month a paper was presented on the K6 Rotary Engine (IC) by Prof. Wyszynski at the KONES2018 Engine & PowerTrain Conference in Poland.



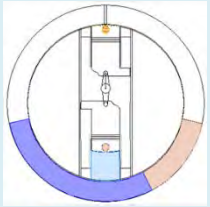
K6 Rotary Engine – A Case Study (4)

- Having Prof. Wyszynski stand up in front of his peers and state that the K6 Rotary Engine is worthy of further study represents a major milestone.
- We now have the confidence to start looking at crowdfunding in support of the project.
- Crucially, no money changed hands. The only costs were in getting to UoB for meetings every 6-8 weeks during term time.
- At around the same time that we reached out to UoB, individual members of the ASTT were reaching out to us (namely Paul Hibberd, Richard Coleby and Jamie Keyte).
- Richard is currently providing us with invaluable assistance by helping us to design a steam prototype.



K6 Rotary Engine – A Case Study (5)

- If money was not the motivation (as none was available), what motivated members of the ASTT and UoB to become involved?
- Pretty obvious for the ASTT members, as we were seeking to build a novel type of steam engine!
- For Prof. Wyszynski, he gained:
  - An opportunity to examine something new and different.
  - An ability to offer a wider range of projects to students.
  - Access to new projects reduces the risk of students plagiarising results from their peers.
  - Possibility of consultancy fees for UoB at a later date, if and when funding secured.
  - Good publicity for the faculty and professional recognition, if the project proves successful.



K6 Rotary Engine – A Case Study (6)

- For the students, they gained:
  - Interesting and challenging project work.
  - A chance to uncover design and performance aspects which have never been seen before.
  - A chance to learn and make use of industry standard software for problems which it was not necessarily designed for , requiring some thought and improvisation.
  - Possibility of future employment.
- For us as the innovators, we gained:
  - Technical analysis using sophisticated software tools on an educational licence, which would otherwise have been prohibitively expensive to acquire commercially.
  - Confidence to continue investing in the project.
  - Contact with students, who might become future employees.
  - Reassurance that we are not mad!



Outreach – How do we do it?

- We would need to set up an Outreach function and make someone responsible for it.
- Outreach would need to examine the ASTT's projects and aspirations, seeking to identify areas of activity with a potential for partnership.
- In looking for such potential, we must attempt to see through the eyes of others.
- Remember that the reasons you want to do something may not be the same as someone else's:



"It's an interesting and challenging problem!"

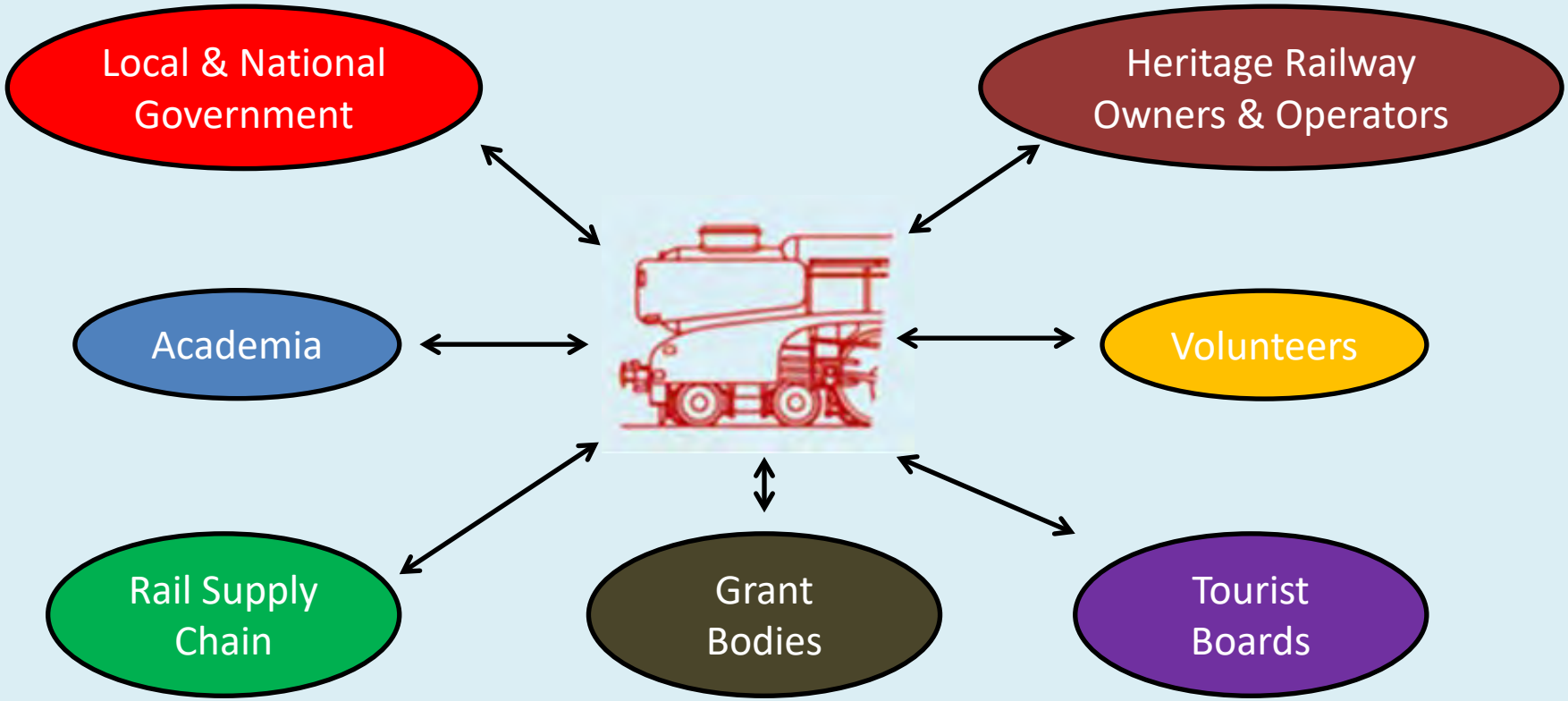


"It's STEAM, dammit!"



Outreach – How do we do it? (2)

The ASTT could reach out in a number of different directions. It is a two-way dialogue, not a one-way marketing message:





Outreach – How do we do it? (3)

In each case, we need to put compelling arguments for partnering with us, which are tailored to who we are talking to:

How your skills can help the ASTT

Fun!

Interesting & challenging 'real world' problems

Keeping steam alive and accessible

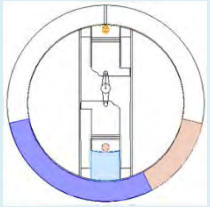
Value of Heritage Market

See data never collected before



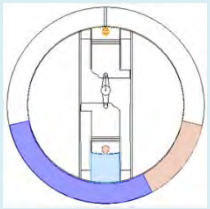
Outreach – Next steps?

- Does this presentation make sense, or does it sound like the Government's latest Brexit proposals?
- If the former, does it sound like something the ASTT should get involved in?
- Key skills for any potential Outreach Officer:
  - A good communicator.
  - Able to gain a good technical overview of the various ASTT projects, if not a detailed understanding.
  - Able to identify which projects might benefit from Outreach.
  - Able to identify what is likely to excite the various potential partners, and to engage with them.
- And finally…



Update on the K6 Rotary Engine

- Currently working out how to build a physical model of the K6 steam version, using a 3D printer.
- Already mentioned the technical paper being presented this month at KONES 2018 on Poland by Prof. Miroslaw Wyszynski of UoB, which we see as a major step forward.
- More realistic now in terms of likely timescales for a K6 rotary-powered mainline locomotive (7–10 years), having identified the necessary intermediate steps.
- Looking at a crowdfunding exercise for early-mid 2019, in support of a steam-powered canal boat, as well as a 10 ¼ “ gauge loco.



Update on the K6 Rotary Engine (2)

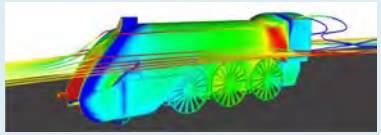
Steam version



Prototype Bench Test



Miniature Railways



K6 Series of Rotary-Driven Steam Locomotives



Canal/River

IC Version



Prototype Bench Test



CHP Applications



Full Commercialisation



ANY QUESTIONS?