## Assignment 2 Cycle Analysis of the Jet Engine based on Nasa tables

Applying conservation equations and the Nasa tables fill out table 2.1. The code and approach should be explained in detail in the following pages. As an example a worked-out part is given for the diffusor (page 5)

**Specifieke gasconstante voor lucht en mix aanpassen**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| State | **1** | **2** | **3** | **4** | **5** | **6** |
| P (kPa) | 55.00 |  | 7\*P2 | P3 |  | Pamb=55.00 |
| T (K) | 250 |  |  |  |  |  |
| v (m/s) | 200 | ~0 | ~0 | ~0 | ~0 |  |
| ***Table 2.1: Thermodynamic state summary*** | | | | | | |

## Diffusor

|  |
| --- |
|  |
| Code snippet diffusor [1-2] |

### Procedure

**Determine**

Solved is first (line 48)



to determine *T2* then applying isentropic compression to solve for the pressure (line 60)

.

Mixture properties determined using f.i. (e.g. **line nr??**)



The composition *Yi* is taken equal to that of normal air.

s1=s2 (fig 8.19). Also is equal to zero according to energy conservation.

## Compressor

|  |
| --- |
|  |
| Code snippet Compressor [2-3] |

### Procedure

**Determine**

Compressor ration:

So P3 can be calculated.

No according to energy conservation so equals zero.

can be found according to:

So are known, and can be found with nasa tables (function inplot).

With , can be calculated.

## Combustor

|  |
| --- |
|  |
| Code snippet Combustor [3-4] |

### Procedure

**Determine and complete table 2.2**

equals (line 122)

So T4 can be determined with interplot (line 127).

Energy conservation:

So equals zero again. (line 143)

Complete table 2.2

|  |  |  |
| --- | --- | --- |
|  | **AF=71.25 (equivalence ratio=1)** | |
| **Mass fractions** | Initial | Final |
| Fuel | 0.0139 | 0 |
| O2 | 0.2331 | 0 |
| N2 | 0.753 | 0.753 |
| CO2 | 0 | 0.184 |
| H2O | 0 | 0.063 |
| **Table 2.2: Mixture composition before and after the combustor** | | |

An example calculation for nitrogen initial:

## Turbine

|  |
| --- |
|  |
| Code snippet Turbine [4-5] |

### Procedure

Determine

According to conservation of energy:

And since: we can write:

Therefore we can calculate using interplot & nasa table (line 169 &156).

No according to energy conservation so equals zero (line 153)

## Nozzle

|  |
| --- |
|  |
| Code snippet Nozzle [5-6] |

### Procedure

Determine

And since we know that:

And

we can find and with nasa (line 185 & 189).

according to energy conservation:

Now it is also possible to calculate