



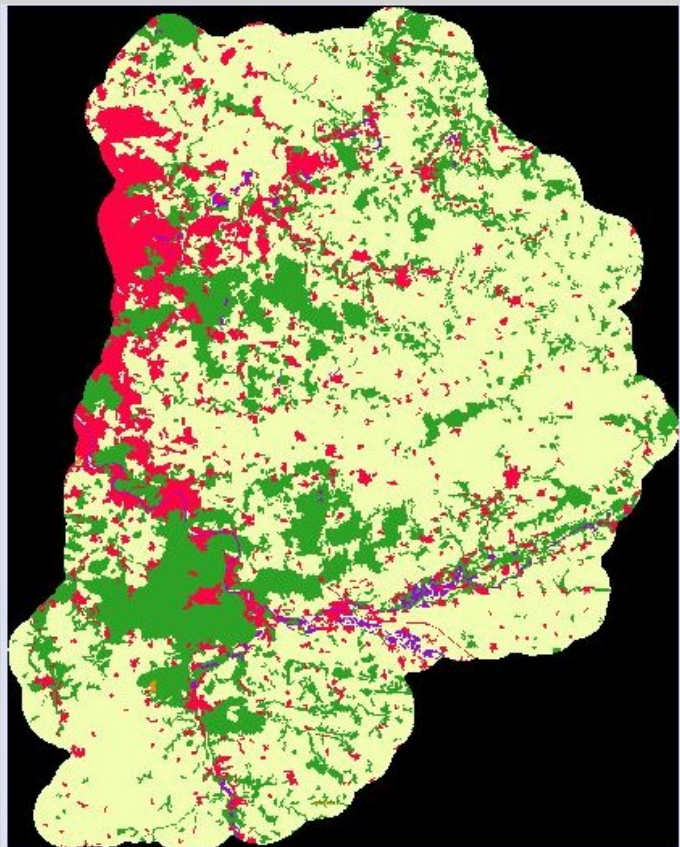
D E P A R T E M E N T
D E
G E O G R A P H I E



Master degree
mutatis mutandis.
UE Custom project

liftr
With custom french template

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pdf_document customisation :

http://rmarkdown.rstudio.com/pdf_document_format.html

1 section

1.1 subsection

1.1.1 subsubsection

1.1.1.1 paragraph

1.1.1.1.1 subparagraph

subsubparagraph (What ? You wanted more ?)

An ionocraft¹ or ion-propelled aircraft (commonly known as a lifter or hexalifter) is a device that uses an electrical electrohydrodynamic (EHD) phenomenon to produce thrust in the air without requiring any combustion or moving parts.

2 Images and footnotes

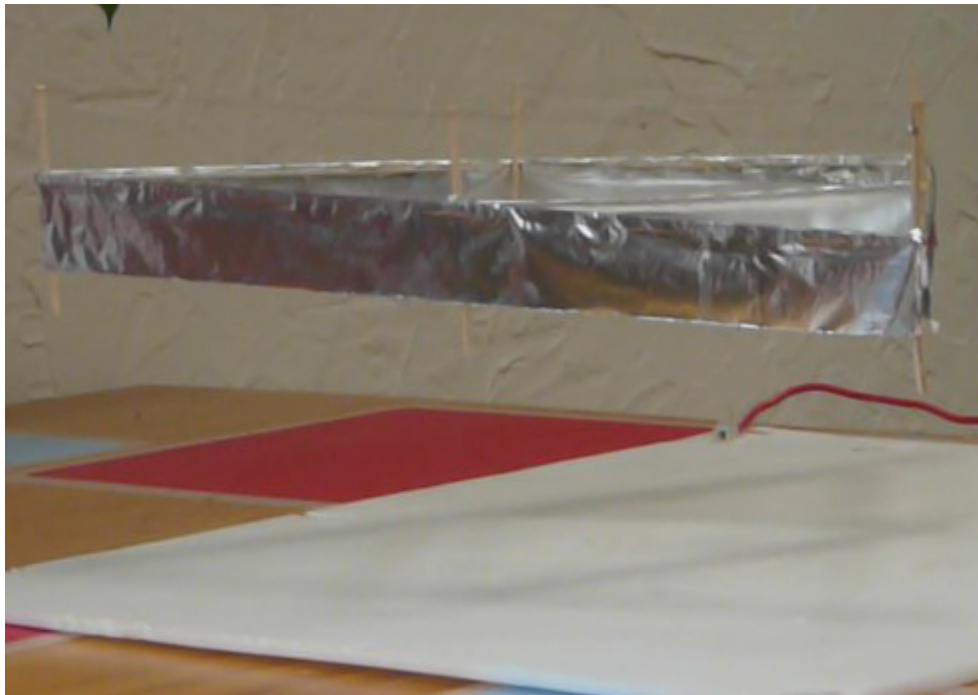


FIG. 1. Flying Lifter v2²

1. <https://en.wikipedia.org/wiki/Ionocraft>

2. Anonymous59 CC-BY-SA Creative Commons <https://commons.wikimedia.org/wiki/File:FlyingLifterv2.png>

3 code

```
import sys

print sys.version

## 2.7.13 (default, Jan 19 2017, 14 :48 :08)
## [GCC 6.3.0 20170118]
```

4 r code

4.1 tibble

The examples are from : <https://github.com/tidyverse/tibble>.

```
library("tibble")
as_tibble(iris)

## # A tibble : 150 x 5
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
##   <dbl>         <dbl>         <dbl>         <dbl> <fctr>
## 1         5.1         3.5         1.4         0.2 setosa
## 2         4.9         3.0         1.4         0.2 setosa
## 3         4.7         3.2         1.3         0.2 setosa
## 4         4.6         3.1         1.5         0.2 setosa
## 5         5.0         3.6         1.4         0.2 setosa
## 6         5.4         3.9         1.7         0.4 setosa
## 7         4.6         3.4         1.4         0.3 setosa
## 8         5.0         3.4         1.5         0.2 setosa
## 9         4.4         2.9         1.4         0.2 setosa
## 10        4.9         3.1         1.5         0.1 setosa
## # ... with 140 more rows

tibble(x = 1:5, y = 1, z = x ^ 2 + y)
```

```
## # A tibble : 5 x 3
##       x     y     z
##   <int> <dbl> <dbl>
## 1     1     1     2
## 2     2     1     5
## 3     3     1    10
## 4     4     1    17
## 5     5     1    26
```

```
tibble(
  ~x, ~y, ~z,
  "a", 2, 3.6,
  "b", 1, 8.5)
```

```
## # A tibble : 2 x 3
##       x     y     z
##   <chr> <dbl> <dbl>
```

```
## 1    a    2    3.6  
## 2    b    1    8.5
```

4.2 ggplot2

The example is from : <https://github.com/tidyverse/ggplot2>.

```
library("ggplot2")  
  
ggplot(mpg, aes(displ, hwy, colour = class)) +  
  geom_point()
```

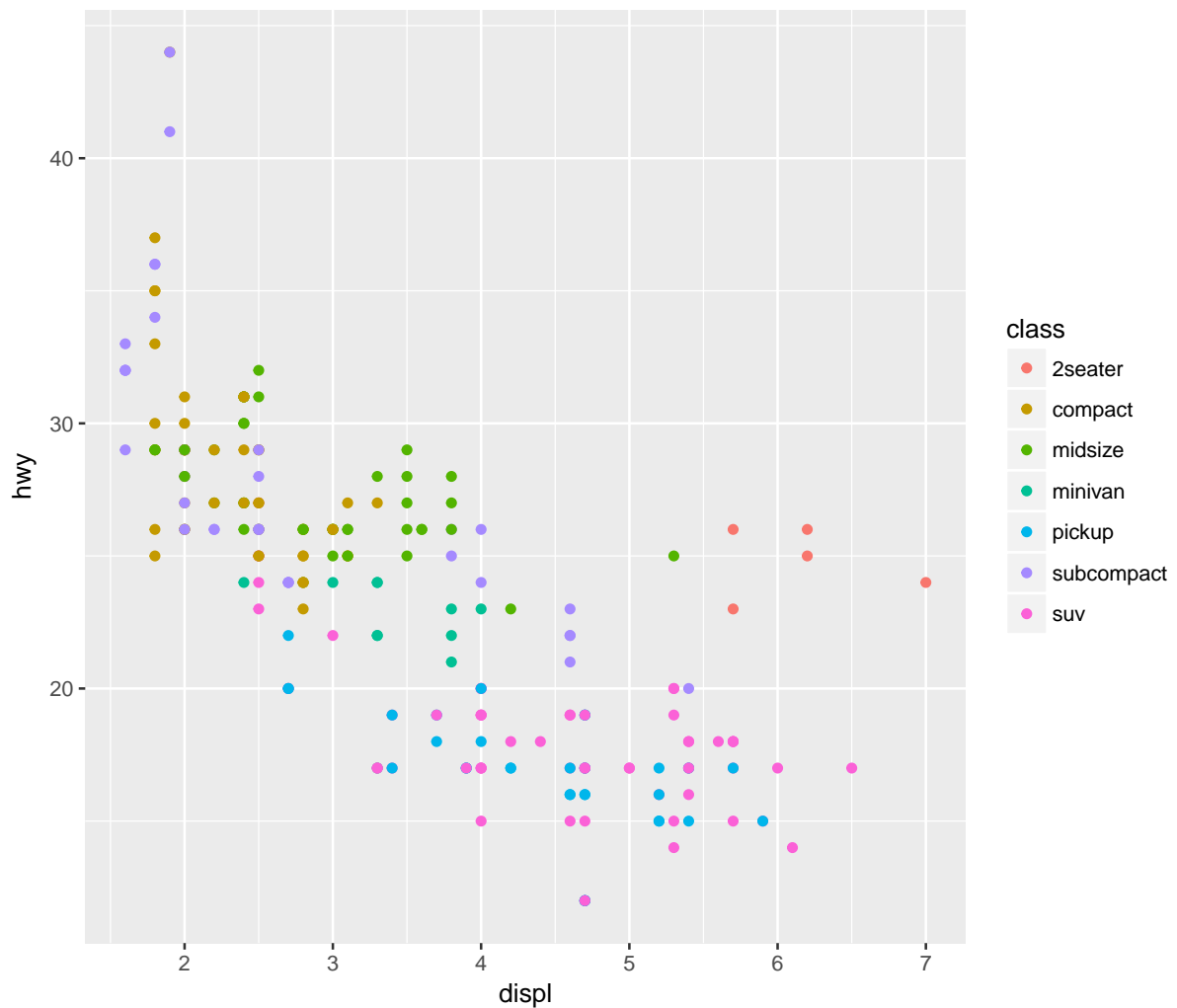


FIG. 2. Engine displacement and fuel consumption

4.3 purrr

The example is from : <https://github.com/tidyverse/purrr>.

```
library("purrr")  
  
mtcars %>%
```

```
split(.$cyl) %>% # from base R
map(~ lm(mpg ~ wt, data = .)) %>%
map(summary) %>%
map_dbl("r.squared")
```

```
##           4           6           8
## 0.5086326 0.4645102 0.4229655
```

4.4 dplyr

The examples are from : <https://cran.rstudio.com/web/packages/dplyr/vignettes/introduction.html>.

```
library("dplyr")
```

```
##
## Attaching package : 'dplyr'

## The following objects are masked from 'package :stats':
##
##   filter, lag

## The following objects are masked from 'package :base':
##
##   intersect, setdiff, setequal, union
```

```
library("nycflights13")
```

```
filter(flights, month == 1, day == 1)
```

```
## # A tibble : 842 x 19
##   year month   day dep_time sched_dep_time dep_delay arr_time
##   <int> <int> <int>   <int>         <int>         <dbl>   <int>
## 1  2013     1     1     517           515           2     830
## 2  2013     1     1     533           529           4     850
## 3  2013     1     1     542           540           2     923
## 4  2013     1     1     544           545          -1    1004
## 5  2013     1     1     554           600          -6     812
## 6  2013     1     1     554           558          -4     740
## 7  2013     1     1     555           600          -5     913
## 8  2013     1     1     557           600          -3     709
## 9  2013     1     1     557           600          -3     838
## 10 2013     1     1     558           600          -2     753
## # ... with 832 more rows, and 12 more variables : sched_arr_time <int>,
## #   arr_delay <dbl>, carrier <chr>, flight <int>, tailnum <chr>,
## #   origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #   minute <dbl>, time_hour <dtm>
```

```
slice(flights, 1:10)
```

```
## # A tibble : 10 x 19
##   year month   day dep_time sched_dep_time dep_delay arr_time
##   <int> <int> <int>   <int>         <int>         <dbl>   <int>
## 1  2013     1     1     517           515           2     830
## 2  2013     1     1     533           529           4     850
```

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```
## 3 2013 1 1 542 540 2 923
## 4 2013 1 1 544 545 -1 1004
## 5 2013 1 1 554 600 -6 812
## 6 2013 1 1 554 558 -4 740
## 7 2013 1 1 555 600 -5 913
## 8 2013 1 1 557 600 -3 709
## 9 2013 1 1 557 600 -3 838
## 10 2013 1 1 558 600 -2 753
## # ... with 12 more variables : sched_arr_time <int>, arr_delay <dbl>,
## #   carrier <chr>, flight <int>, tailnum <chr>, origin <chr>, dest <chr>,
## #   air_time <dbl>, distance <dbl>, hour <dbl>, minute <dbl>,
## #   time_hour <dtm>
```

```
arrange(flights, year, month, day)
```

```
## # A tibble : 336,776 x 19
##   year month   day dep_time sched_dep_time dep_delay arr_time
##   <int> <int> <int>   <int>         <int>         <dbl>   <int>
## 1 2013     1     1     517           515           2     830
## 2 2013     1     1     533           529           4     850
## 3 2013     1     1     542           540           2     923
## 4 2013     1     1     544           545          -1    1004
## 5 2013     1     1     554           600          -6     812
## 6 2013     1     1     554           558          -4     740
## 7 2013     1     1     555           600          -5     913
## 8 2013     1     1     557           600          -3     709
## 9 2013     1     1     557           600          -3     838
## 10 2013     1     1     558           600          -2     753
## # ... with 336,766 more rows, and 12 more variables : sched_arr_time <int>,
## #   arr_delay <dbl>, carrier <chr>, flight <int>, tailnum <chr>,
## #   origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #   minute <dbl>, time_hour <dtm>
```

```
select(flights, year, month, day)
```

```
## # A tibble : 336,776 x 3
##   year month   day
##   <int> <int> <int>
## 1 2013     1     1
## 2 2013     1     1
## 3 2013     1     1
## 4 2013     1     1
## 5 2013     1     1
## 6 2013     1     1
## 7 2013     1     1
## 8 2013     1     1
## 9 2013     1     1
## 10 2013     1     1
## # ... with 336,766 more rows
```

```
mutate(flights,
  gain = arr_delay - dep_delay,
  speed = distance / air_time * 60)
```



```
## # A tibble : 336,776 x 21
##   year month   day dep_time sched_dep_time dep_delay arr_time
##   <int> <int> <int>   <int>         <int>         <dbl>   <int>
## 1  2013     1     1     517             515           2     830
## 2  2013     1     1     533             529           4     850
## 3  2013     1     1     542             540           2     923
## 4  2013     1     1     544             545          -1    1004
## 5  2013     1     1     554             600          -6     812
## 6  2013     1     1     554             558          -4     740
## 7  2013     1     1     555             600          -5     913
## 8  2013     1     1     557             600          -3     709
## 9  2013     1     1     557             600          -3     838
## 10 2013     1     1     558             600          -2     753
## # ... with 336,766 more rows, and 14 more variables : sched_arr_time <int>,
## #   arr_delay <dbl>, carrier <chr>, flight <int>, tailnum <chr>,
## #   origin <chr>, dest <chr>, air_time <dbl>, distance <dbl>, hour <dbl>,
## #   minute <dbl>, time_hour <dtm>, gain <dbl>, speed <dbl>
```

```
summarise(flights,
  delay = mean(dep_delay, na.rm = TRUE))
```

```
## # A tibble : 1 x 1
##   delay
##   <dbl>
## 1 12.63907
```

5 Session information

The R session information for compiling this document is shown below.

```
sessionInfo()
```

```
## R version 3.4.2 (2017-09-28)
## Platform : x86_64-pc-linux-gnu (64-bit)
## Running under : Debian GNU/Linux 9 (stretch)
##
## Matrix products : default
## BLAS/LAPACK : /usr/lib/libopenblas-r0.2.19.so
##
## locale :
##  [1] LC_CTYPE=en_US.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8      LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8  LC_MESSAGES=C
##  [7] LC_PAPER=en_US.UTF-8     LC_NAME=C
##  [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages :
## [1] methods      stats      graphics  grDevices  utils      datasets  base
##
## other attached packages :
## [1] bindrcpp_0.2      nycflights13_0.2.2 dplyr_0.7.4
```

```
## [4] purrr_0.2.4      ggplot2_2.2.1      tibble_1.3.4
## [7] shiny_1.0.5       rmarkdown_1.6      knitr_1.17
##
## loaded via a namespace (and not attached) :
## [1] Rcpp_0.12.13      compiler_3.4.2     plyr_1.8.4         highr_0.6
## [5] bindr_0.1         tools_3.4.2        digest_0.6.12      evaluate_0.10.1
## [9] gtable_0.2.0      pkgconfig_2.0.1    rlang_0.1.2        yaml_2.1.14
## [13] stringr_1.2.0     rprojroot_1.2      grid_3.4.2         glue_1.1.1
## [17] R6_2.2.2          magrittr_1.5       backports_1.1.1    scales_0.5.0
## [21] htmltools_0.3.6   assertthat_0.2.0   mime_0.5           xtable_1.8-2
## [25] colorspace_1.3-2  httpuv_1.3.5       labeling_0.3        stringi_1.1.5
## [29] lazyeval_0.2.0    munsell_0.4.3
```

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